BULLETIN DE L'INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE BIOLOGIE, 77: 23-75, 2007
BULLETIN VAN HET KONINKLIJK BELGISCH INSTITUUT VOOR NATUURWETENSCHAPPEN BIOLOGIE, 77: 23-75, 2007

The characterization of the Kilimanjaro *Lophuromys aquilus* TRUE 1892 population and the description of five new *Lophuromys* species (Rodentia, Muridae)

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Abstract

We revised the taxonomy of the *Lophuromys flavopunctatus* species complex based on craniometric measurements of > 3000 specimens and cytochrome b sequences of selected specimens collected throughout East Africa. Our approach, that consists of measuring skulls of a series of localities (topo-typical if possible), allowed us to compile a number of Operational Taxonomical Units (OTU's) from across the geographic range of this species complex. The outcome of diverse multivariate analyses complemented with the available chromosomal data allowed us to (a) evaluate the craniometrical and genetic variation within this dataset, (b) to provide a more detailed characterisation of *Lophuromys aquilus* and *laticeps*, and (c) to identify five OTU's that are described as new species.

Key-words: Rodentia, Africa, *Lophuromys*, taxonomy, new species, craniometry, cytochrome b, genetics.

INTRODUCTION

The genus *Lophuromys* (TRUE, 1892) represents a peculiar group of mice with a distribution range that is restricted to sub Saharan Africa (MUSSER & CARLETON, 2005). Because of the unique, stiff hairs that make up their pelage, these species are known as 'brush-furred rats', 'harsh-furred rats' or 'coarse-haired mice'. These chunky mice have relatively short legs, and while some species can be speckled, the color of their pelage ranges from tan to greenish grey and dark brown. Their belly can be rusty, orange, brown, or even cream colored. In order to facilitate their escape from predators, the tails and the fragile skin of these solitary species break easily.

These small mammals thrive in moist habitats. Their geographical distribution appears to be determined by rainfall (density and seasonal pattern) and not by altitude, temperature or biotope structure (KINGDON, 1974; DIETERLEN 1976). Their typical diet consists of ants, other insects and invertebrates, small vertebrates, carrion, and plant matter. It is noteworthy that they appear to feed more on animal matter than most Muridae (DIETERLEN, 1976).

The *Lophuromys flavopunctatus* THOMAS, 1888 s. l. species complex groups the so-called African "speckled brush furred" rats that occur from North-Eastern Angola through Southern Congo, Northern Mozambique, Tanzania, Burundi, Rwanda, Eastern Congo, Northern Congo, Uganda, Southern Kenya and Ethiopia, the latter being separated from the rest of the species complex by dry lowlands (MUSSER & CARLETON, 2005). To date, fifteen species have been described (VERHEYEN *et al.*, 2002, Appendix 1.1 and Figure 1).

The relatively patchy distribution ranges of these species suggest that they probably originated as the result of allopatric speciation. Neighboring regions with suitable moist habitats that are separated by dry corridors, are typically occupied by different species (LAVRENCHENKO *et al*. this issue). Consistent with the fact that these mammals thrive in moist habitats only, gene flow is either absent, or greatly restricted, among these isolated pockets (MUSSER & CARLETON, 2005). The number of recognized species in this genus has increased in recent years and it is likely that the true diversity of this group remains to be discovered (LAVRENCHENKO *et al*, 1998, 2001, 2004, this issue).

The present study builds upon the results of our previous paper on the taxonomy of the East African *L. flavopunctatus* species complex (VERHEYEN *et al*, 2002). In that study we concluded that no satisfactory

† Walter VERHEYEN and Marco CONTI passed away before this study was completed. This study is dedicated to them.

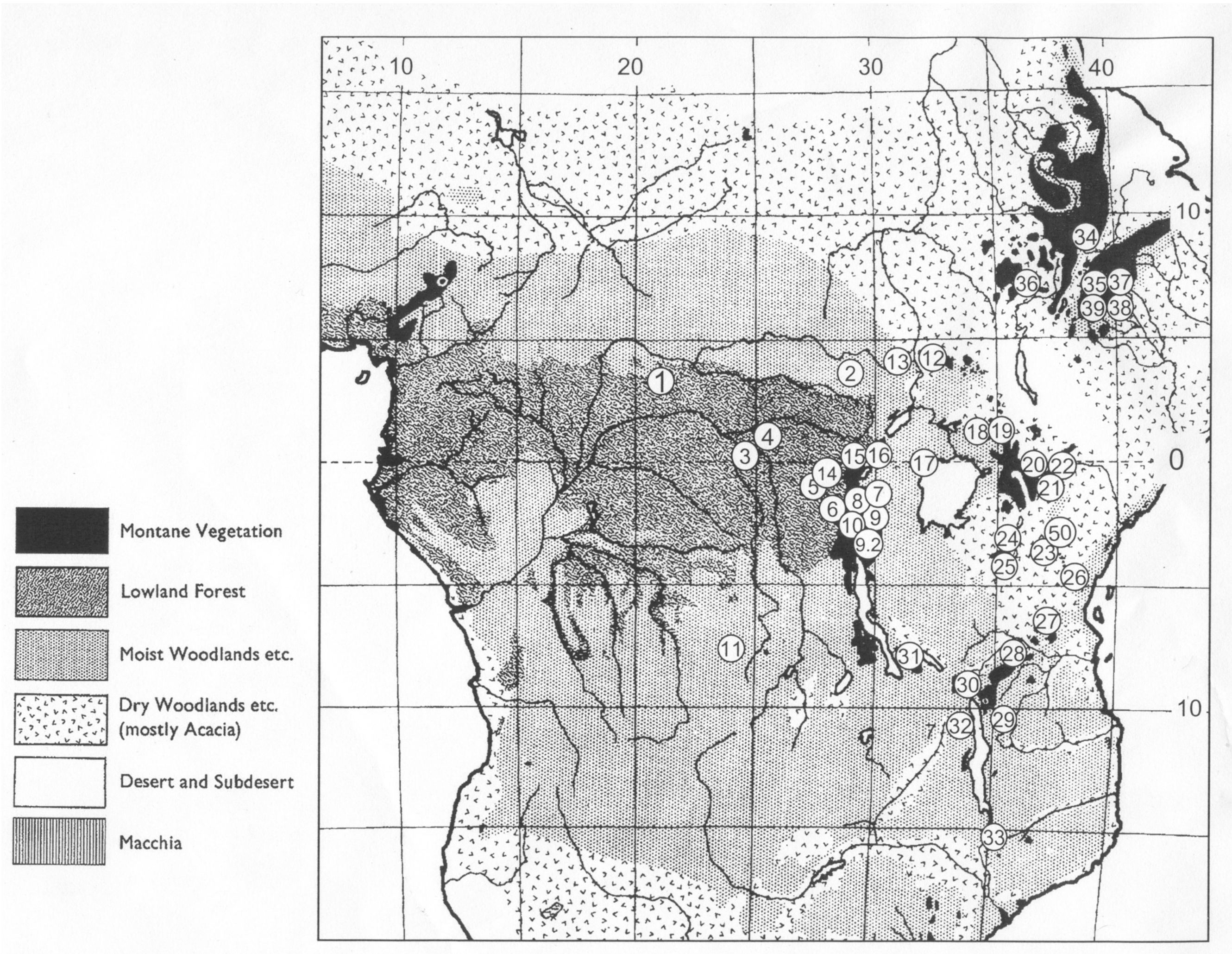

Fig. 1 Map with the geographical distribution of the studied East African *Lophuromys* OTU's. The studied taxa analysed here are *dudui* (OTU's 2, 4, 5), *rita* (11*), laticeps* (OTU's 7-10), *margarettae* (OTU's 19, 20,22), *zena* (OTU's 21 & 22), *verhageni* (OTU 23), *flavopunctatus* (34), *chrysopus* (38+39), *brunneus* (36), *melanonyx* (35), *brevicaudus* (37) and *aquilus* (50). Coordinates of all these localities can be found in VERHEYEN *et al*., 2002 except for the new unit OTU 9.2 (Bukinanyana 02.53°S, 29.20°E).

taxonomic solution was possible for this species complex, without reliable specimen and tissue sample collections for *L. aquilus* TRUE, 1892, as the only type skull for this species [USNM 34723] is damaged. New specimens collected during two expeditions to the Mt Kilimanjaro area (the type locality), together with a specimen collection from Mt Ruwenzori (J. C. K. PETERHANS), allowed us to gather an adequate topo-typical series of specimens and tissue samples for *L. aquilus.* Combined with the craniometrical data of approximately 3000 specimens, grouped into about 50 operational taxonomical units (OTU's) (VERHEYEN *et al.*, 2002), the present data set covers the entire geographical distribution of the *L. flavopunctatus* species complex.

The combination of craniometrical data for (topo-) type specimens, with a selection of mtDNA sequences and chromosomal data, allows us to assign species names to the detected OTU's. This approach allows us to address the taxonomic problems for the East African representatives of the *L. flavopunctatus* species complex, an exercise that results in a more detailed characterisation of *L. aquilus* and *laticeps* and the description of five new species.

MATERIAL AND METHODS

The specimens

Since this paper is an extension of our previous study on the *L. flavopunctatus* species complex, we refer to that paper for detailed information on material and craniometrical and statistical methods (VERHEYEN *et al.*, 2002).

The present study is largely based on specimen collections that are the result of field trips in Africa, realized between 1965 and 1995 by the Research group on African Rodents (Department of Biology, University of Antwerp). All specimens were prepared for study at the University of Antwerp before being deposited at the Royal Museum for Central Africa (RMCA-Tervuren, Belgium). Where necessary, our study material was compared with material (specimens and tissues for DNA sequences) from other museums and institutions (appendix 1). Appendix 1 lists the OTU's in which our specimens are grouped. For each OTU the number of specimens is provided, grouped by sex and age class. For listings of all the studied specimens, the collection localities of the individual specimens, and the map with the geographical distribution of the OTU's, we refer respectively to VERHEYEN *et al.* (2002, Appendix 3 & Figure 2).

We grouped the *Lophuromys* specimens from East Kilimanjaro in OTU 50.1. This OTU includes specimens from several localities and altitudes: Mweka, Marangu Gate, Mandara Camp and the Maundi Crater. The specimens labeled West Kilimanjaro were assigned to OTU 50.2. This OTU includes specimens collected in Simba, Londorosi and Shira. The Mt Ruwenzori specimens were grouped in OTU 14, and additional Ruwenzori specimens that were collected at lower altitudes, constitute OTU 14.1. For more details, we refer to Appendix 1.

We could not detect properly any clear-cut color pattern differences in the pelage that would characterize these taxa. Indeed, our specimens are all fixed in formalin and later conserved in alcohol so that the small external differences with dry type skins become impossible to evaluate properly. Neither did we find any important difference in plantar and claw morphology, rhinarium, ear shape or the scale pattern on the tail.

Craniometry

We applied the same methods as in VERHEYEN *et al.* (1996, 2000, 2002). Using tooth eruption and tooth-wear patterns described earlier, we grouped all skulls in age classes (VERHEYEN *et al.*, 1996). We also used the same cranial and external measurements and the same acronyms (*loc. cit.*). Measurements were taken with calipers with digital reading graduated to hundreds of millimeters, but readings were made with a precision of 0.05 mm. To facilitate the interpretation of our results, we included the description of the used cranial measurements and their acronyms (appendix, table 1).

Basic statistics, Students t-tests (SOKAL & ROHLF, 1969), Multiple Discriminant Analysis (Canonical Analysis) were performed with statistical package STATISTICA 5. 5 (Statsoft, Inc.). Statistical analyses were always carried out using the whole set of available data, regardless of sex, but excluding data from specimens of age classes 0 and 5. Finally, we constructed tree-diagrams based on the Mahalanobis Squared Distances between the centroids using the Unweighted Pair Group Arithmetic Average method (SNEATH & SOKAL, 1973). This method accounts for all the relevant axes in the canonical hyperspace. For more details, we refer to (VERHEYEN *et al.* , 1996, 1997, 2000, 2002).

DNA methods

Most of the tissue samples were collected between 1986 ands 1989 during the Tanzanian Belgian Rodent Project (Sokoine University of Agriculture - University of Antwerp - ABOS) and 2 recent expeditions on Kilimanjaro (November 2002 and March 2003). All tissues were stored in ethanol at 4°C. Additional tissues were also obtained from Rwanda, D.R.Congo and Kenya during field trips of our research teams as well as through the help of many colleagues. For full details of the analyzed tissues, we refer to Appendix 1.

Total DNA was extracted from frozen or ethanol preserved muscle or liver tissues using the QuiaAmp DNA Minikit. The partial mitochondrial cytochrome b sequences (402 bp) were amplified using primers L13724 and H14139 (KOCHER *et al.*, 1989). PCR amplifications were carried out in 25µl reaction volumes, containing 10µM of each primer, 200 µmol dNTPs, 10mM Tris-HCL, 1. 5 mM $MgCl_2$, 50 mM KCl (pH 8. 3) and 1 unit Taq polymerase.

The used PCR conditions were as described elsewhere. The PCR products were cleaned using the GFX PCR DNA and Gel band Purification Kit (Amersham Biosciences). Dye terminator cycle sequencing was performed following the manufacturer's instructions. The PCR products were sequenced using the same primers. The reaction products were either run on an ABI 310 sequencer in the molecular laboratory of the RBINS or at the VIB sequencing facility at the University of Antwerp. To validate the mitochondrial origin of the obtained cytochrome b sequences, the corresponding amino acid sequences were screened for

Table 1. Alphabetical gazetteer of the collecting localities of the Ethiopian *Lophuromys*. The localities are followed by their co-ordinates and approximate altitudes (m). The numbers preceding the localities refer to fig. 1 illustrating the distribution of the species.

MEAS. NUMB.	ACRONYMS	MORPHOMETRICAL CHARACTERS
M 1	GRLS	greatest length of skull
M 2	PRCO	condylobasal length
M 3	HEBA	henselion-basion
M 4	HEPA	henselion-palation
M 5	PAFL	length of palatal foramen
M 6	DIA 1	length of diastema
M 7	DIA 2	distance between alveolus M1 and cutting edge of upper incisor
M 8	INTE	smallest interorbital breadth
M 9	ZYGO	zygomatic breadth
M 10	PALA	smallest palatal breadth
M 11	UPTE	length of upper cheekteeth
M 12	UPDA	breadth of upper dental arch
M 13	M1 BR	greatest breadth of first upper molar
M 14	ZYPL	greatest breadth of zygomatic plate
M 15	BNAS	greatest breadth of nasals
M 16	LNAS	greatest length of nasals
M 17	LOTE	length of mandibular teeth
M 18	CHOB	greatest breadth of choanae
M 19	BULL	length of auditory bulla
M 20	BRCA	greatest breadth of braincase
M 21	DINC	depth of upper incisor
M 22	ROHE	mediosagittal projection of rostrum heigth
M 23	ROBR	greatest rostrum breadth
M 24	PCPA	distance between coronoid and angular processes

the presence of stop codons, deletions or inserts, using MEGA 3.0 (Kumar *et al.,* 2001).

The sequences were aligned against the cytochrome b sequences of *Mus musculus* (Bibb *et al*., 1981), *Rattus rattus* (Suzuki *et al*., 2000) and already published cytochrome b sequences (Verheyen *et al*., 2002, Lavrenchenko *et al*., 2001, 2004). Parsimony (MP) and distance (NJ) methods were implemented using PAUP version 4.0b10 (Swofford 2004) with settings as in the results.

Cytological methods

Chromosome metaphases were obtained from bone marrow following Hsu & Patton (1969). Cell suspensions in fixative were transported at the Dipartimento di Biologia Animale e dell'Uomo, Università di Roma 'La Sapienza' and to the Department of Biology, University of Antwerp, where slides were prepared. Metaphases were stained by the Giemsa standard method (pH 7. 0). Pictures of metaphases were collected using a digital camera Photometrics Sensys 1600 and the software Iplab (Scanalytics, Inc. , version 2. 420).

Results

1. Craniometry of *L. aquilus* (Tables 2.1, 2.2 & 2.3; Graphs 1.1 & 1.2)

1. 1. Craniometrical variation within *L. aquilus*

Before regrouping all the collected Kilimanjaro *Lophuromys* into a single OTU representing *L. aquilus* True, 1892, we evaluated the possible influence of age, sex, altitude and geographic origin on the used craniometrical measurements.

We used our biggest Kilimanjaro series (East = 42 specimens) to demonstrate that there is only a very limited sexual dimorphism in the skull (Table 2.1.) as well as a very limited growth between age class 2 and 3 (Table 2.2). Both results are concordant with our previous findings (Verheyen *et al*. 2002, p. 143).

Concerning the possible influence of altitude on the morphometry of the cranium (Graph 1.1) craniometrical measurements for Marangu Gate forest specimens (altitude above sea level 1700-2150 meters) overlap completely with those from Mandara forest (2570-2720 m), whereas Maundi Crater (moorland at 3275-3595 m) is slightly differentiated along the second axis. Since we could not detect any consistent character to separate the moorland from the forest specimens, we conclude that all the East Kilimanjaro skulls can be regrouped in OTU 50.1 (Kilimanjaro East).

Table 2.3 compares OTU 50.1 (Kilimanjaro East) with OTU 50.2 (Kilimanjaro West) and illustrates that both populations differ only for M5 (PAFL) and M22 (ROHE) and in a somewhat lesser degree also for M7 (DIA2); the differences in M1 (GRLS) and M17 (LOTE) are very slight and rarely significant. Concerning the body measurements, the hind foot-length (HF) appears to be somewhat bigger in specimens from the eastern population. A subsequent forward discriminant analysis between OTU 50.1 (Kilimanjaro East) and OTU 50.2 (Kilimanjaro West) shows an important overlap between both populations when data for age classes (1-4) and males and females are combined (Graph 1.2).

Summarized, we conclude that the detected sexual, age, altitudinal and population variation remains sufficiently low in order to justify our option to group all our Kilimanjaro skull material into a single OTU 50 (Kilimanjaro East and West).

1. 2. Morphometrical differentiation between *aquilus* and *verhageni* (Graphs 1.1, 2.1 & 11; Appendix, Tables 3.1, 3.3 & 6.1)

A backward discriminant analysis demonstrates that the young and damaged type-skull of *L. aquilus* True 1892 clusters within OTU 50 (Kilimanjaro West and East) and not with neighboring Mt Meru *L. verhageni* Verheyen *et al*., 2002 (OTU 23) (Graph 2.1). The obtained classification is correct for 99. 3% and the discriminating variables are M5 (PAFL), M12 (UPDA), M15 (BNAS), M19 (BULL) and M23 (ROBR).

To evaluate which measures are significantly different (% diff. mean), we compared the skull measures between OTU 50 (Kilimanjaro East and West) and OTU 23 (Mt Meru) (Table 6.1).

The first conclusion is that for the 24 cranial measures taken 17 differ very significantly between these two species. In addition, even when the skulls of these species are approximately of the same size (M1, M2, M3, M4, M20, M9), the *L. verhageni* skulls are smaller than *L. aquilus* for the rostrum length (M5, M6, M7, M14, M16) and rostrum height (M22), interorbital constriction (M8), choanae breadth (M18), and depth of the upper incisor (M21). However, they tend to have a clearly more important rostrum breadth (M23), and larger molar measures (M11, M13, M12, M17).

A canonical analysis based on craniometrical measurements separates *verhageni* (OTU 23: Mt Meru) from two neighboring OTU's: *aquilus* (OTU 50: Mt Kilimanjaro) and OTU26 (Usambara East) populations, with a level of correct classification of 100% (Graph 11).

Finally, we also note that *verhageni* (OTU23: Mt Meru) differs from *aquilus* (OTU 50: Kilimanjaro) by its more important ear length (+6. 5%), and a shorter tail (-7%) (see Tables 3.1 & 3.3).

1. 3. Morphometric differentiation between *aquilus* and OTU 26 (Usambara East) (Graphs 2.2, 11 & 12; Appendix, Table 6.1)

The data summarized in table 6.1 show that OTU 26 (Usambara East) is significantly smaller than *aquilus* (OTU 50) for eleven out of twenty four measurements, while it is bigger for eight, and not significantly different for five measurements. We also observe that compared with OTU 26 (Usambara East), *aquilus* has a longer rostrum (M6, M7, M15), heavier upper incisors (M21), but a narrower zygomatic plate (M14) and rostrum (M23).

Graph 2.2 shows the result of a backward discriminant analysis between *aquilus* (OTU 50) and OTU 26 (Usumbara East) (*see* Table 9, function 5). Again, the percentage of correct classification is high (99. 2%) with as discriminating variables: M5 (PAFL), M6 (DIA1), M12 (UPDA), M14 (ZYPL), M19 (BULL), M21 (DINC) and M23 (ROBR).

Two canonical analyses demonstrate that the *aquilus* population (OTU 50: Mt Kilimanjaro) can be differentiated from the neighboring Usambara East (OTU 26) population as well as from *verhageni* (OTU 23: Mt Meru), again with very high percentages of correct classification (graphs 11 & 12). Here also we can safely conclude that these OTU's are craniometrically clearly distinct. Moreover, we conclude that the Usambara population (OTU 26) is sufficiently different to require its description as a new species.

1. 4. Morphometric differentiation between *aquilus* and OTU 8 (Mutura: representing *laticeps* s. l.) (Graph 2.3; Appendix, Tables 3.1, 3.2, 6.1)

The data summarized in table 6. 1 illustrate that *laticeps* (OTU 8: Mutura) is significantly smaller than *aquilus* (OTU 50) for ten out of twenty four measurements, while it is bigger for ten and not significantly different for four measurements. It appears that *aquilus* (OTU 50) has a longer rostrum (M1, M2, M3, M4, M6, M7, M16), somewhat heavier upper incisors (M21) and bigger bullae (M19), but also smaller upper molars (M11, M12, M13), a much narrower rostrum (M23) with contrasting wide nasals (M15), and a somewhat overall more slender skull and mandible (M9, M20, M10, M24).

Graph 2.3 displays the outcome of a backward discriminant analysis between *aquilus* (OTU 50) and *laticeps* (OTU 8) (Table 9, function 1). The percentage of correct classification is again high (98,1%) and the discriminating variables are: M1 (GRLS), M2 (PRCO), M9 (ZYGO), M11 (UPTE), M14 (ZYGP), M15 (BNAS), M19 (BULL) and M23 (ROBR).

Finally, it is remarkable that *aquilus* (OTU 50) has lower body weight than *laticeps* (OTU 8), while it is a clearly bigger species for all the external measures considered here (TOL, HB, TL up to 12%; for EL and HF between 3,6 and 4, 9%) (tables 3.1 & 3.2).

In conclusion it seems that *aquilus* is morphometrically readily distinguishable from *laticeps*, a finding that supports our view that both are different taxa (*see* further).

1. 5. Conclusions concerning the taxon *L. aquilus*

The skull of *L. aquilus* TRUE, 1892, when compared with important series of surrounding populations, can easily be characterized by discriminant functions. When evaluating the importance of the observed univariate differences between adjacent populations and *aquilus* reveal that the *aquilus* skull is characterized by a longer and narrower rostrum, and by heavier upper incisors.

2. Redefining the craniometric variation within the *L. flavopunctatus* s. l. species complex (Graphs 3, 7 & 8)

In our previous publication on the craniometry of the *L. flavopunctatus* s. l. species group (VERHEYEN *et al*., 2002, page 159) we noted: "… it is apparent that the east African populations of the "speckled" *Lophuromys* regroup in four taxonomical and geographical entities". At that time, we lacked appropriate OTU of Mt Kilimanjaro that would have allowed us to reach a satisfying taxonomical solution concerning *L. aquilus*. Based on the available evidence we used OTU 26 (Usambara East) to represent *aquilus*. With the new and important series of skulls of Mt Kilimanjaro (OTU 50) we are presently able to re-evaluate the validity of the presumed link between OTU 26 and *L. aquilus*.

Our analyses also include two new *Lophuromys* samples from the Mt Ruwenzori (OTU's 14 and 14.1), that were not available during our previous study. Because the craniometrical variation of these populations exceeded what we considered to be acceptable for a homogeneous taxon, the taxonomical status of the *Lophuromys* populations from the Mts Ruwenzori was not addressed before. The variability detected for the *Lophuromys* population of the Mts Ruwenzori is similar to what was detected for the Mt Kenya samples; that contains representatives of two species (*zena* and *margarettae*).

Our craniometrical results for the *L. aquilus* populations of Mt Kilimanjaro indicate that altitude has only slight influence on the skull features of this taxon (Graph 1.1). This finding contrasts with results for the *Lophuromys* populations from Mt Kenya and Mt Ruwenzori, where the populations occurring at different altitudes are craniometrically different. For example, graph 7 demonstrates that OTU 14 (Mt Ruwenzori - Bujuku) can be easily differentiated on craniometrical measurements from the Kenyan *Lophuromys,* and that OTU 21 + 22 (Aberdare + Mt Kenya) representing *L. zena* from high altitudes are craniometrically distinct from the *margarettae* populations represented by OTU 20 (Solai). Moreover, a combined analysis of specimens from Mt Elgon - Cherangani Hills - Mt Kenya (OTU's 18, 19, 22. 1) shows that they fit in with OTU 20 (Solai) whereas OTU (19.1) from Kaptagat mainly overlaps with *zena* OTU (21 + 22) (Graph 7).

Finally, graph 8 shows that the *Lophuromys* specimens from the lower altitudes of Mt Ruwenzori (OTU 14.1) plot entirely within OTU 5 (Irangi) which suggests that populations from the western flank of the western Rift differ from OTU 14.

3. Craniometric evidence for geographical variation in sexual dimorphism (Appendix, Table 8)

Whereas sexual dimorphism is absent or very limited in 11 out of the 17 examined OTU's, it is clearly present in the three OTU's from the Eastern Arc Region (OTU 26, 27, 30) (Table 8). OTU 26 (Usambara East) and, in a somewhat lesser degree, OTU 27 (Uluguru Range) are characterized by sexual dimorphism, the male skull being longer (M2) with a higher rostrum (M22) and a higher mandibular ramus (M24).

Also for OTU 23 (Mt Meru) and OTU (21+22) of the Aberdare Range and Mt Kenya, the male skull is somewhat longer (M2-M3) with a higher rostrum (M22) than in females. Finally, in OTU 30 (Mt Rungwe) we detect that the males have a longer diastema-length (M6) coupled with a higher rostrum (M22) and a wider interorbital region (M8).

Summarized, the typical male skull of the "speckled" *Lophuromys* from the "Eastern Arc Region" is somewhat bigger than the female skull and has a longer and higher rostrum. This phenomenon is particularly clear in OTU 26 (Usambara East).

4. Karyotype of *L. aquilus*.

The only karyotyped *L. aquilus* specimen originates from the mountain forests on the eastern flank of Mt Kilimanjaro (T1950). Although the quality of the obtained chromosomes was not optimal, the karyotype (2n=68) resembles that of specimens from Mt Meru. Therefore, *L. aquilus* appears to belong to the 2n=68 cytotype group as defined by CORTI, CASTIGLIA & VERHEYEN (2004), as do the karyotyped specimens from Bondwa Mt (Uluguru Range), Nakahuga (highlands of the eastern shore of Lake Malawi) and Gerodom (Mt Hanang) (that however have all NFa=90).

In this context it is interesting to note that also three out of five Ethiopian species (*flavopunctatus*, *brevicaudus*, *brunneus*) have 2n = 68 (but with NFa = 78), and that the two remaining taxa (*chrysopus* with 2n=54 (NFa = 60) and *melanonyx* with 2n = 60 (NFa = 90)) appear to belong to different cytotype groups.

We distinguish two main karyotypes 2n = 68 (NFa = 84-90) and 2n = 70 (NFa = 80-84-86) among the studied East African *L. flavopunctatus* s. l. specimens. The first karyotype 2n = 70 is also found in northern Ethiopia (Mt Guna, Debra Tabor, Vanaye), Eastern Ethiopia (Chercher Mounts) and even in South-Western Ethiopia (Sheko forest); the second karyotype 2n = 68 (Nfa = 78) appears to be restricted to Southern Ethiopia (Beletta Forest and Menangesha Forest) (LAVRENCHENKO *et al*., 2004). However, we still lack information from several important groups such as OTU 14 (Ruwenzori Mount), OTU 26 (Usambara East), OTU 21 (Aberdare), OTU 22 (Mt Kenya) and OTU 4 (Kisangani RB).

Summarized, each of the main karyotypes (2n=68 and 2n=70) is found over a large part of the total geographic range of the "speckled" *Lophuromys*. However, we lack information from too many key-regions to infer a detailed zoogeographic distribution of karyotypes.

5. Genetic characterization of *L. aquilus* (Graphs 9, 10)

With the description of *L. dudui* and *L. verhageni* we introduced the use of partial mtDNA sequences as an additional tool to characterize and identify these taxa (VERHEYEN *et al*., 2002). We were particularly struck (p. 154) by the discrepancy between the much higher genetic distance between the Mt Meru and the *L. aquilus* population from Mt Kilimanjaro (approximately 60 km apart, uncorrected p=4. 5%); and the much lower genetic distance between the Mt Kenya and the Aberdare Range populations (approximately 50 km apart, average p=0. 1%). The observed combination of morphological and genetic differentiation between Mt Meru and Mt Kilimanjaro populations appears to justify our earlier description of *verhageni*.

However, to resolve whether our Mt Kilimanjaro sample collected in Mweka (approximately 3100 m altitude above sea level) truly represents *L. aquilus*, we estimated the intra-specific variation of the *Lophuromys* populations by sequencing twenty eight specimens captured on the slopes of Mt Kilimanjaro in six localities separated by altitude (1800-3590 m) and distance (3 to 40 km apart). This area includes very different biotopes (fields, shrubbery, degraded mountain forest, mountain forest and alpine moorland) that are all characterized by heavy rainfall (more than 2000 mm/ year), important variation in intensity of daily sunshine (clear to misty) and rather high temperature fluctuations between day and night (in moorland even regular nightly frost).

The relatively low amount of genetic variation detected for the *Lophuromys* populations on Mt Kilimanjaro (Graph 9) suggests that we may indeed assume that this mountain is inhabited by a single species (*L. aquilus*), attaining the same level of intra-specific variation as the *zena* populations inhabiting Mt Kenya and the Aberdare Range. This result also confirms our earlier assumption that the Mweka specimen (RUCA 14364) represents a valid topo-type for *L. aquilus* (VERHEYEN *et al*., 2002).

6. The mtDNA phylogeny of the *Lophuromys flavopunctatus* species group

The phylogenetic tree shown was obtained with the neighbor joining method (K2p distances, 1000 bootstrap replicates and selected *Acomys* sequences as outgroups) to evaluate the phylogenetic relationships among the assayed East African "speckled" *Lophuromys* populations across their entire distribution range (Graph 10). To facilitate the discussion of the obtained phylogenetic and phylogeographic patterns, the labels of each sequence provide the specimen number, the sampling locality, the topographical unit (mountain range) and the corresponding craniometric OTU.

We are aware that the used sequencies are relatively short and that the inferred relationships are to be interpreted with caution. Future studies using longer mitochondrial and nuclear sequencies will address this issue in depth. Nevertheless, we note that *L. chrysopus* is a genetically well-differentiated taxon that appears to share a common ancestor with all East African "speckled" *Lophuromys.* This suggests that South Ethiopian forests (Godare Forest: 07. 21 N-35. 13 E, alt. 1200 m; Sheko Forest: 07. 04°N - 35. 30°E, altitude 1930 m; Beletta forest: 07. 32°N - 36. 33°E, alt. 2050 m; Harenna Forest: 06. 42°N - 39. 44°E, alt. 2400 m) have been the cradle of the whole "*flavopunctatus*" species group that subsequently colonized virtually suitable habitats throughout Ethiopia and East Africa.

All other Ethiopian species (*L. flavopunctatus*, *L. brevicaudus, L. brunneus* and *L. melanonyx*) are also genetically clearly differentiated from each other, and from all other East African taxa. It is interesting to observe that both *L. brunneus* and *L. melanonyx* appear to be associated with one of the two major genetic lineages that represent all the other known East African "speckled" *Lophuromys*. The first lineage groups *L. aquilus* (Mt Kilimanjaro), *L. verhageni* (Mt Meru), representatives of the Uluguru - Ukaguru and Usambara mountain ranges with the Ethiopian representative *L. brunneus*. The genetic distances between the latter four lineages, and all other investigated species, exceeds 4% (uncorrected sequence divergence). Combined with the observed craniometrical differences, this implies that the Uluguru–Ukaguru–E.Usambara group is sufficiently differentiated from other *Lophuromys* to represent a new species.

The second lineage groups three species that are genetically equally differentiated from each other (>3.5%): *melanonyx* - a craniometrical and chromosomal defined species, *zena* and *laticeps*. Within this lineage, cytb sequences of several morphologically distinguishable subgroups [*laticeps, dudui* and *rita* and three geographical groups: Mt Hanang (OTU 25), Ufipa Plateau (OTU 31), Eastern Arc (OTU's 30, 29, 28, 32)] differ by 2.5% or more. Finally, the partial cytochrome b sequence from Mt Ruwenzori (OTU 14) differs 3.1% from the *zena* sequences, again suggesting that also this group may include a new allopatric species.

We conclude that the combination of the genetic and the craniometric data suggests that not less that five new taxa represent allopatric species that merit to be described. The reason to give species status to these taxonomical units will depend on the combination of genetical, craniometrical and chromosomal data.

7. Taxonomic interpretation of craniometrical, genetic and chromosomal data

The craniometrical, genetic and chromosomal data of a representative sample of the "speckled" *Lophuromys* from Mt Kilimanjaro (OTU 50) allows us to expand on the description of *L. aquilus* TRUE,1892, a species that was originally described on the basis of a single young specimen with a damaged skull. Combined with a series of *Lophuromys* specimens from the higher reaches of Mt Ruwenzori (OTU 14) this typical series of *aquilus* (OTU 50) allows us to complete and amend some of our earlier taxonomic conclusions (VERHEYEN *et al.*, 2002).

Additional information that assists us in this discussion is a set of new cytochrome b sequences from Ethiopian *Lophuromys* (LAVRENCHENKO *et al*., 2004) combined with an important series of new cytochrome b sequences from populations throughout the distribution range of the "speckled" *Lophuromys*.

First, the five Ethiopian *Lophuromys* species recognized so far are clearly distinguishable on the basis of craniometrical measurements (Graph 3). Furthermore, we note that three Ethiopian *Lophuromys* (*flavopunctatus*, *brevicaudus* and *chrysopus*) are genetically differentiated from all non-Ethiopian species (Graph 10). On the other hand, each of the two remaining Ethiopian species (*melanonyx* and *brunneus*) belongs to one of the two sub-clades that contain all other East African *Lophuromys*. Moreover, three species (*brunneus, flavopunctatus* and *brevicaudus*) have a similar chromosomal conformation (2n= 68; NFa = 78), whereas *melanonyx* (2n = 60; NFa = 90) and *chrysopus* (2n = 54; NFa = 60) have - for as far as we know - clearly different karyotypes. Summarized, this analysis confirms that the five known Ethiopian species (*viz. flavopunctatus, brunneus, brevicaudus, chrysopus* and *melanonyx*) can be distinguished by a combination of craniometrical, genetic and chromosomal data [Lavrenchenko *et al*., 2004, 2007 (this issue)].

Within the East African "speckled" *Lophuromys*, it is striking that two species (*aquilus*, OTU 50: Mt Kilimanjaro and *verhageni,* OTU 23: Mt Meru) - that are geographically closer to each other than other *Lophuromys* - are easily distinguishable by craniometrical measurements (Graph 11) and cytochrome b sequences (p≥ 4%, Graph 10). It is important to note that these two species appear to be strictly separated from representatives of the neighbouring *Lophuromys* populations from the Usambara Mountains (Graph 10). In addition, and despite our considerable collecting efforts, we never collected *Lophuromys* from the geographically intermediate Pare Mountains or in the comparatively nearby Taita Hills, Kasigau and Shimba Hills. This is startling because these regions appear to contain suitable biotopes and rainfall conditions for *Lophuromys*.

Craniometrical data suggest that the topo-typical *aquilus* population (OTU 50: Kilimanjaro) differs only slightly from the *zena* population from the Aberdare range and Mt Kenya (Graphs 4 & 6). However, even in the absence of reliable chromosomal data, the genetic distance between the *aquilus* and *zena* representatives is sufficiently high to suggest that they are different species. Furthermore, *L. aquilus* (OTU 50) is also differentiated on the species level from *brunneus* because of genetic, craniometrical and chromosomal differences.

OTU 26 (Usambara East) and OTU 27 (Uluguru Range) represent a sister-group (Graph 10), but they are not sufficiently genetically distinct to embody separate species. This interpretation is based upon the observed intermediate genetic and geographic position of the Ukaguru-specimens, as well as on the low genetic differentiation within this group. Hence, we consider that the Uluguru–Usambara East–Ukaguru populations represent a single taxonomical unit that differs enough from all the other adjacent "speckled" *Lophuromys*" to justify their taxonomic recognition as a new species (Graphs 11, 12).

Craniometrical analyses indicate that the Mt Ruwenzori population (OTU 14) and the Ethiopian *chrysopus* (OTU 38 + 39) have very similar skull shapes (Graph 8). However, both groups appear to be genetically clearly differentiated (Graph 10). Since we have no karyotypes for OTU 14, we cannot verify whether it fits with the *chrysops* karyotype (2n = 54; NFa = 60). Nevertheless, the Bujuku-population of Mt Ruwenzori (OTU 14) is both craniometrically (Graphs 5, 6) and genetically distinct from all neighboring taxa, hence our justification to describe it as a new species.

Our molecular phylogeny clusters the Ethiopian species *melanonyx* with a so-called *laticeps* group (Graph 10). Within this group, *laticeps* s. l. (OTU 8: Mutura) and *dudui* (OTU 4: Kisangani Right Bank) represent species, that are adequately defined by craniometry and sequencing. A less differentiated species, such as *rita* (OTU 3: Kisangani LB; Kikwit 1549 Ngome; OTU 11: Congo S.), represents a valid species that is geographically separated from *dudui* by the Congo River. Since it is recognized that this river represents an important zoogeographical barrier for other mammals (*e. g. Pan paniscus* versus *P. troglodytes*) we judge that the observed level of differentiation between *rita* and *dudui* confirms their taxonomic position.

Finally, three more genetic and craniometric entities can be identified within the *laticeps* group: *viz*. OTU 30 (Mt Rungwe), OTU 25 (Mt Hanang) and OTU 31 (Ufipa plateau) (graphs 10, 12 and 13). The Nyika plateau (OTU 32), Mufindi (OTU 28), Peramiho (OTU 29) overlap for their craniometrical (Graph 16) and genetic features and are not sufficiently differentiated from the Mt Rungwe (OTU 30) population to merit a separate taxonomical status.

Based on the arguments above, we conclude that the East African "speckled" *Lophuromys flavopunctatus* s. l. species complex contains five undescribed allopatric taxa.

8. Taxonomic results.

8. 1. Description of *Lophuromys stanleyi* n. sp. (OTU 14)

Holotype

FMNH 144.812; ad. male; skin, skull (complete) + skeleton; collected by J. C. K. Peterhans (4 May 1991) on Mount Ruwenzori-Bujuku (00. 22°N - 29. 58° E; altitude 3700 m); collection number 2170.

Paratypes

22 specimens (12 males, 10 females); age-class 1 (6), age-class 2 (11), age-class 3 (5)

Specimens collected by W. T. Stanley between 9 and 11 December 1991.

FMNH 144. 713 (ad. ♀; skull + skeleton; coll. nr. 847)
FMNH 144. 714 (ad. ♀; skull + skeleton; coll. nr. 848)
FMNH 144. 715 (ad. ♂; skull + skeleton; coll. nr. 850)

FMNH 144. 716 (ad. ♀; skull + skeleton; coll. nr. 851)
FMNH 144. 718 (ad. ♂; skull + skeleton; coll. nr. 861)
FMNH 144. 719 (ad. ♂; skin + skeleton; coll. nr. 862)
FMNH 144. 720 (ad. ♂; skull + skeleton; coll. nr. 863)
FMNH 144. 730 (ad. ♂; skull + skeleton; coll. nr. 894)

SPECIMENS COLLECTED BY J. C. K. PETERHANS BETWEEN 17 APRIL AND 7 MAY 1991.

FMNH 144.741 (ad. ♀; skin; skull + skeleton; coll. nr. 1879)
FMNH 144.750 (ad. ♂; skull + skeleton; coll. nr. 1919)
FMNH 144.753 (ad. ♀; skin, skull + skeleton; coll. nr. 1929)
FMNH 144.754 (ad. ♂; skin, skull + skeleton; coll. nr. 1933)
FMNH 144.755 (ad. ♂; alc. specimen + skull; coll. nr. 1934)
FMNH 144.761 (ad. ♂; alc. specimen + skull; coll. nr. 1975)
FMNH 144.774 (ad. ♂; skin, skull + skeleton; coll. nr. 2019)
FMNH 144.778 (ad. ♀; skull + skeleton; coll. nr. 2032)
FMNH 144.779 (ad. ♂; skin, skull + skeleton; coll. nr. 2033)
FMNH 144.783 (ad. ♂; skull + skeleton; coll. nr. 2081)
FMNH 144.786 (ad. ♀; skin, skull + skeleton; coll. nr. 2100)
FMNH 144.789 (ad. ♂; alc. specimen + skull; coll. nr. 2114)
FMNH 144.794 (ad. ♂; alc. specimen + skull; coll. nr. 2122)
FMNH 144.799 (ad. ♀; skull + skeleton; coll. nr. 2127)
FMNH 144.805 (ad. ♀; skin, skull + skeleton; coll. nr. 2142)
FMNH 144.820 (ad. ♀; alc. specimen + skull; coll. nr. 2802)

REMARK

The craniometrical data of holotype and paratypes are shown in appendix, table 10.

TYPE LOCALITY

J. C. K. PETERHANS collected the holotype from Mount Ruwenzori-Bujuku (00.22°N - 29.58°E; altitude 3700 m) on 4 May 1991. The paratypes were collected by J. C. K. PETERHANS (between 17 April and 7 May 1991) and W. T. STANLEY (between 9 and 11 December 1991).

ETYMOLOGY

We dedicate this new species to William "Bill" STANLEY (Field Museum, Chicago, USA).

DIAGNOSIS

L. stanleyi can be differentiated from all the other taxa of the genus *Lophuromys* through craniometry (Graphs 5, 6, 7 & 8) and mtDNA sequencing (Graph 10).

To define this new taxon we compared it with *L. aquilus* (OTU 50, Kilimanjaro East + West), *L. dudui* (OTU 4, Kisangani Right Bank), *L. margarettae* (OTU 20 Solai), *L. zena* (OTU 21+22, Aberdare Range) and *L. chrysopus* (OTU 38+39).

EXTERNAL CHARACTERS

L. stanleyi is statistically significantly larger than *L. dudui* (OTU 4) for all measurements (TOL, HB, HF, TL & EL) [no data on body weight for *dudui*, Tables 4. 4 and 5.1]. Compared to than *L. laticeps* s. l (OTU 8) this species is also significantly bigger (TOL, HB, HF & EL) but has a lower body weight (W) and the same tail length (TL) (Tables 4. 4 & 3. 2).

UNIVARIATE ANALYSIS (Appendix, Tables 4.4, 6.1, 6.3 & 7)

When we compare OTU 14 (Mount Ruwenzori) (Table 6.1) with OTU 50 (Kilimanjaro East + West) representing topo-typical *L. aquilus*, we see that for 20 measurements the Ruwenzori-population (OTU 14) is clearly smaller; the difference is most pronounced for M6 (DIA1) and M16 (LNAS). On the other hand the Ruwenzori population (OTU 14) has a significantly wider M8 (INTE) and M14 (ZYGP) than *L. aquilus*.

The univariate comparison of OTU 14 (Mount Ruwenzori) with the typical cranial series of *L. dudui* (OTU 4) shows that the former has a bigger skull (in 17 out of the 24 measurements, table 6. 3). *L. stanleyi* is somewhat smaller than *L. dudui* for M10 (PALA), M12 (UPDA) and M23 (ROBR).

Summarized, in comparison with *L. dudui*, *L. stanleyi* is a somewhat bigger species with a narrower rostrum.

Finally, a comparison between OTU 14 (Mount Ruwenzori) and our *L. chrysopus* series (OTU 38 & 39) shows that for 14 out of the 24 measurements, the differences are small (Table 6.3). However, OTU 14 (Ruwenzori) is bigger than *L. chrysopus* for M7 (DIA2), M8 (INTE), M9 (ZYGO), M10 (PALA), M15 (BNAS), M19 (BULL), M20 (BRCA), M22 (ROHE) and M24 (PCPA), but smaller for M1 (GRLS), M5 (PAFL), M6 (DIA1), M11 (UPTE) and M18 (CHOB).

The skull of *L. stanleyi* is thus of comparable size as *L. chrysopus*, but is also overall somewhat broader with clearly more pro-odont upper incisors and somewhat narrower choanae and smaller upper molars.

DISCRIMINANT ANALYSIS (Graphs 5, 6, 7, 8; Table 9, functions 8, 16, 19 & 26)

In the forward discriminant analysis *L. stanleyi* is always perfectly separated from the other OTU's, the Wilks' Lambda coefficients are always very low and the percentage of correct classification becomes in most cases 100%.

When we compare the four backward discriminant functions obtained by processing successively OTU 14 (Mount Ruwenzori) with *L. aquilus* (function 8), *L. laticeps* (function 16), *L. zena* (function 19) and *L. dudui* (function 10) we see that the obtained functions retain from four to seven measurements out of the 24 available and that, even with these backward analyses with few variables retained, the percentages of correct classification are high (between 94. 2 and 100%).

Genetic characterization

The partial cytochrome b sequencies of this species and the other *Lophuromys* taxa studied here can be accessed via http://home.bebif.be/muridae (Terryn *et al*., 2007).

8. 2. Description of *Lophuromys kilonzoi* n. sp. (OTU 26 + OTU 27, Fig. 1)

Holotype

RMCA 96. 037-M-2348; adult, scrotal male; alc. specimen; skull complete, collected by Herwig Leirs (13 November 1987) in Magamba (04. 45°S - 38. 17° E; altitude 1550 m); collection number RUCA 7619. Sequenced specimen.

Paratypes

Magamba: 22 specimens (11 males, 11 females); age class 1 (2); age class 2 (12); age class 3 (8).

RMCA 96.037. M-2334 (ad. ♀; alc. specimen; skull; coll. nr. 7511)
RMCA 96.037. M-2335 (ad. ♂; alc. specimen; skull; coll. nr. 7516)
RMCA 96.037. M-2336 (ad. ♂; alc. specimen; skull; coll. nr. 7520)
RMCA 96.037. M-2337 (ad. ♂; alc. specimen; skull; coll. nr. 7521)
RMCA 96.037. M-2340 (ad. ♀; alc. specimen; skull; coll. nr. 7526)
RMCA 96.037. M-2344 (ad. ♂; alc. specimen; skull; coll. nr. 7601)
RMCA 96.037. M-2345 (ad. ♂; alc. specimen; skull; coll. nr. 7611)
RMCA 96.037. M-2346 (ad. ♀; alc. specimen; skull; coll. nr. 7612)
RMCA 96.037. M-2349 (ad. ♀; alc. specimen; skull; coll. nr. 7620)
RMCA 96.037. M-2353 (ad. ♀; alc. specimen; skull; coll. nr. 7685)
RMCA 96.037. M-2354 (ad. ♀; alc. specimen; skull; coll. nr. 7686)
RMCA 96.037. M-2356 (ad. ♀; alc. specimen; skull; coll. nr. 7693)
RMCA 96.037. M-2357 (ad. ♀; alc. specimen; skull; coll. nr. 7699)
RMCA 96.037. M-2359 (ad. ♂; alc. specimen; skull; coll. nr. 7716)
RMCA 96.037. M-2360 (ad. ♀; alc. specimen; skull; coll. nr. 7717)
RMCA 96.037. M-2361 (ad. ♂; alc. specimen; skull; coll. nr. 7718)
RMCA 96.037. M-2362 (ad. ♂; alc. specimen; skull; coll. nr. 7719)
RMCA 96.037. M-2363 (ad. ♂; alc. specimen; skull; coll. nr. 7760)
RMCA 96.037. M-2365 (ad. ♂; alc. specimen; skull; coll. nr. 7769)
RMCA 96.037. M-2372 (ad. ♀; alc. specimen; skull; coll. nr. 7826)
RMCA 96.037. M-2373 (ad. ♂; alc. specimen; skull; coll. nr. 7828)
RMCA 96.037. M-2379 (ad. ♀; alc. specimen; skull; coll. nr. 7927) (sequenced specimen)

Remarks

The craniometrical data of the types are summarized in appendix, Table 11. All specimens were collected with snap-traps (museum special) by Herwig Leirs between 12 and 17 November 1987 in Magamba (04. 45°S - 38. 17°E; altitude. 1550 m). To allow a statistically valid characterization OTU 26 (Usambara East) includes not only the topo-typical series from Magamba, but also a number of skulls from the neighboring localities Emau, Gologolo, Manolo, Viti (Verheyen *et al*., 2002, p. 172).

Type locality

The biotope where the specimens were caught is described mostly as “sylvatic” but also as forest or fallow land.

Etymology

We have the pleasure to dedicate this new taxon to Bukheti Swalehe Kilonzo (Sokoine University of Agriculture, Morogoro, Tanzania).

Diagnosis

L. kilonzoi is a new representative of the *L. flavopunctatus* species complex and can readily be differentiated from the other *Lophuromys* species through craniometry (Graphs 11 and 12) and mtDNA sequencing (Graph 10).

We selected *L. aquilus* (OTU 50: Mount Kilimanjaro East + West) and OTU 23 (Mount Meru), topo-typical series of *L. verhageni*, to define this new taxon.

External characters

L. kilonzoi is statistically significantly bigger than *L. verhageni* (OTU 23, Mt Meru) for TOL, TL and HF (tables 3. 3 and 3. 4). Compared to *L. aquilus* (OTU 50, Mt Kilimanjaro) *L. kilonzoi* has considerably longer ears (EL), but a slightly shorter hindfoot (HF) (Tables 3.1 & 3.4)

Univariate analysis (Appendix, Tables 6.1 & 7)

A comparison with the topo-typical population of *L. aquilus* (OTU 50: Kilimanjaro East + West) shows that *L. kilonzoi* has a significantly smaller skull, which is best expressed by the following length measures (M1, M2, M3, M4, M6, M7, M15, M16) with percentages between 1. 5 and 8. 6%. We also note that the bullae length (M19) and the depth of the upper incisor (M21 DINC)) are somewhat smaller (respectively 6.6% and 6.7%) as well as the rostrum height (M22 ROHE) (3. 8%).

On the other hand we see that *L. kilonzoi* is significantly bigger (between 1.9 and 4.7%) for the palatal region and upper molars, M5 (PAFL), M10 (PALA), M11 (UPTE), M12 (UPDA), M13 (M1BR) as well as for the zygomatic plate M14 (ZYPL), rostrum breadth M23 (ROBR) and ramus-height of mandibula M24 (PCPA).

Summarized, we can characterize the skull of *L. kilonzoi* versus *L. aquilus* as having a clearly shorter, more depressed but broader rostrum with more developed zygomatic plate, less heavy upper incisors but with a somewhat wider palate and heavier upper dental arch and a more strongly developed ramus of the mandibula as well as smaller bullae.

Compared with *L. laticeps* (OTU 8: Mutura) we can describe *L. kilonzoi* as having a skull of about the same length but with a slightly more slender (M9, M20, M15, M22, M23) aspect. We further note that it has somewhat longer palatinal foramina (M5) and heavier zygomatic plates (M14), which contrasts with the slender rostrum. Also both molar rows (M11 and M17) are somewhat shorter than in the *L. laticeps* skull (Table 7).

Discriminant analysis (Graphs 11, 12; Table 9: functions 4, 12, 20, 21 & 22)

The canonical analysis (forward) performed with OTUs 50 (*L. aquilus*), OTU 23 (*L. verhageni*) and OTU 26 (*L. kilonzoi*) yields a very small Wilks' Lambda value and allows the characterization of all these taxa with a percentage of correct classification of 100%. The canonical function includes 18 of the 24 measures available.

Graph 12 summarizes the outcome of another canonical analysis (forward) that compares OTU 50 (*L. aquilus*), OTU 30 (Mt. Rungwe) and OTU 26 (*L. kilonzoi*). The canonical function includes 22 of the 24 measures. Also in this case, the percentages of correct classification are very high (97. 8% - 100%).

But even backward discriminant analysis (Table 9: function 4) characterizing *L. aquilus* (OTU 50) versus *L. kilonzoi* n. sp. (OTU 26) allows a close to 100% correct classification and needs only 7 discriminating measures to achieve this goal: M5 (PAFL), M6 (DIA1), M12 (UPDA), M14 (ZYPL), M19 (BULL), M21 (DINC) and M23 (ROBR).

Similarly, a set of backward discriminant functions (Table 9: functions 12, 20, 21 & 22), needing between 4 and 8 discriminating measures, achieves an acceptable (93 - 100%) correct classification of *L. kilonzoi* versus respectively *L. laticeps, L. zena, L. verhageni* and *L. machangui* n. sp. .

Genetic characterization

The partial cytochrome b sequencies of this species and the other *Lophuromys* taxa studied here can be accessed via http://home.bebif.be/muridae (Terryn *et al*., 2007).

8. 3. Description of *Lophuromys machangui* n. sp. (OTU 30 + OTU 28, 29, 32, Fig. 1)

Holotype

RMCA 96. 037. M-2263; adult, scrotal male; collected by Marc Colyn, Jan Stuyck and Walter Verheyen (23 September 1987) on Mount Rungwe (09. 10°S - 33. 39°E; altitude 2300 m; forest); collection number RUCA 6372.

Paratypes

30 specimens (15 males, 15 females): age class 2 (16); age class 3 (11); age class 4 (3). All specimens were collected between 19 and 24 September 1987.

RMCA 96.037. M - 2207 (ad. ♀; alc. specimen; skull; coll. nr. 5943

RMCA 96.037. M - 2215 (ad. ♀; alc. specimen; skull; coll. nr. 6167

RMCA 96.037. M - 2216 (ad. ♂; alc. specimen; skull; coll. nr. 6170
RMCA 96.037. M - 2217 (ad. ♂; alc. specimen; skull; coll. nr. 6171
RMCA 96.037. M - 2226 (ad. ♂; alc. specimen; skull; coll. nr. 6205
RMCA 96.037. M - 2228 (ad. ♂; alc. specimen; skull; coll. nr. 6220
RMCA 96.037. M - 2231 (ad. ♂; alc. specimen; skull; coll. nr. 6253
RMCA 96.037. M - 2232 (ad. ♂; alc. specimen; skull; coll. nr. 6254
RMCA 96.037. M - 2233 (ad. ♀; alc. specimen; skull; coll. nr. 6257
RMCA 96.037. M - 2234 (ad. ♂; alc. specimen; skull; coll. nr. 6258
RMCA 96.037. M - 2235 (ad. ♀; alc. specimen; skull; coll. nr. 6260
RMCA 96.037. M - 2236 (ad. ♀; alc. specimen; skull; coll. nr. 6262
RMCA 96.037. M - 2237 (ad. ♂; alc. specimen; skull; coll. nr. 6270
RMCA 96.037. M - 2238 (ad. ♂; alc. specimen; skull; coll. nr. 6271
RMCA 96.037. M - 2246 (ad. ♀; alc. specimen; skull; coll. nr. 6298
RMCA 96.037. M - 2247 (ad. ♂; alc. specimen; skull; coll. nr. 6301
RMCA 96.037. M - 2248 (ad. ♀; alc. specimen; skull; coll. nr. 6305 - sequenced specimen
RMCA 96.037. M - 2257 (ad. ♀; alc. specimen; skull; coll. nr. 6357
RMCA 96.037. M - 2258 (ad. ♂; alc. specimen; skull; coll. nr. 6358
RMCA 96.037. M - 2261 (ad. ♀; alc. specimen; skull; coll. nr. 6369
RMCA 96.037. M - 2262 (ad. ♂; alc. specimen; skull; coll. nr. 6371
RMCA 96.037. M - 2264 (ad. ♀; alc. specimen; skull; coll. nr. 6373
RMCA 96.037. M - 2265 (ad. ♂; alc. specimen; skull; coll. nr. 6377
RMCA 96.037. M - 2267 (ad. ♀; alc. specimen; skull; coll. nr. 6387
RMCA 96.037. M - 2268 (ad. ♀; alc. specimen; skull; coll. nr. 6389
RMCA 96.037. M - 2270 (ad. ♀; alc. specimen; skull; coll. nr. 6428
RMCA 96.037. M - 2271 (ad. ♀; alc. specimen; skull; coll. nr. 6429
RMCA 96.037. M - 2272 (ad. ♀; alc. specimen; skull; coll. nr. 6430
RMCA 96.037. M - 2273 (ad. ♂; alc. specimen; skull; coll. nr. 6434
RMCA 96.037. M - 2274 (ad. ♂; alc. specimen; skull; coll. nr. 6435

REMARKS

The craniometrical data of holotype and paratypes are summarized in appendix (Table 12).

Jan STUYCK *et al.* collected all specimens with snaptraps (museum special) on Mount Rungwe between 19 and 24 September 1987. To increase the sample size, OTU 30 (Mt Rungwe) includes, next to the topo-typical series from Mt Rungwe, also a number of skulls from the neighboring localities Suma and Ibumba (VERHEYEN *et al*., 2002, pp. 172 - 173).

TYPE LOCALITY

All specimens were collected in biotopes ranging from mountain forest, secondary forest and shrubby vegetation between altitudes from 2000 meter altitude to the peak of the mountain (approximately 2900 m above sea level).

ETYMOLOGY

We have the pleasure to dedicate this new species to Robert MACHANG'U (Sokoine University of Agriculture, Morogoro, Tanzania).

DIAGNOSIS

L. machangui is a new representative of the *L. flavopunctatus* species complex that can be easily defined through craniometry (Graphs 12, 13, 14, 16) and mtDNA sequencing (Graph 10).

Within the East African representative OTU's we choose OTU 50 (*L. aquilus*) and OTU 26 (Usambara E.) to characterize this new species (Table 12).

EXTERNAL CHARACTERISTICS (Appendix, Tables 3.1, 3.4 & 4.1)

L. machangui is a significantly smaller species than *L. kilonzoi* for all external measures, except W (body weight) and HB (head and body), as well for males as for females (ages 2+3). Compared with *L. aquilus* (OTU 50), the females of *L. machangui* are significantly smaller for all external measures; W (weight) and HB (head and body) are not significantly different for the males.

UNIVARIATE CHARACTERIZATION (Appendix, Tables 3. 1, 3. 2, 4. 1 & 7).

When comparing directly the means of the cranial measurements of *L. machangui* (OTU 30: Mt Rungwe) with *L. laticeps* s. l. (OTU 8: Mutura) we find that our new species differs statistically with this reference taxon for 15 out of 24 measures. Overall, *L. machangui* is significantly bigger for M4 (HEPA), M5 (PAFL), M7 (DIA2), M12 (UPDA), M13 (M1BR), M14 (ZYGP) and smaller for M1 (GRLS), M8 (INTE), M9 (ZYGO), M15 (NASB), M20 (BRCA), M21 (DINC), M22 (ROHE) M23 (ROBR) and M24 (PCPA) (Table 7).

Compared with *L. aquilus* (OTU 50), *L. machangui* is significantly bigger for M5 (PAFL), M11 (UPTE), M12 (UPDA), M13 (M1BR), M14 (ZYGP), M17 (LOTE) and M23 (ROBR), and significantly smaller for M1 (GRLS), M2 (PRCO), M3 (HEBA), M4 (HEPA), M6 (DIA1), M7 (DIA2), M8 (INTE), M15 (NASB), M16 (LNAS), M18 (CHOB), M19(BULL), M21(DINC) and M22(ROHE) (Tables 3.1& 4.1).

MULTIVARIATE CHARACTERIZATION (Graphs 12, 13, 14, 16; Appendix, Table 9, functions 5, 13, 22, 23, 24)

This new species can easily be described through a set of canonical analyses (forward) in which several reference taxa are confronted with OTU 30 (Mt Rungwe).

Graph 12 compares *L. machangui* with *L. aquilus* (OTU 50) and *L. kilonzoi* (OTU 26); in the resulting function only 2 of the 24 original measures are discarded, Wilks' Lambda is very low and a very high percent of overall correct classification is observed (98.8%).

In Graph 13 *L. machangui* is compared with *L. laticeps* (OTU 8) and OTU 31 (Ufipa plateau); here 3 out of 24 measures are discarded, but again the percentage of correct classification is high (98.1%).

Graph 14 compares *L. machangui* with two of our yet to describe taxa OTU 25 (Mt Hanang) and OTU 31 (Ufipa plateau); 3 measures are discarded, again Wilks' Lambda is very small and again almost all specimens are correctly classified (99.2%).

When we compare *L. machangui* (OTU 30) with three neighboring OTUs (28, 29 & 32); 7 out 24 available measures are discarded, the Wilks' Lambda has a higher value but the overall percentage of correct classification drops substantially to 87.5% (Graph 16). We conclude that the "speckled" *Lophuromys* of the Kipengere Range, the Uzungwa's, the Nyika Plateau and the north-eastern side of Lake Malawi are craniometrically not sufficiently differentiated to be recognized as new taxa.

We also refer to the Appendix (Table 9, numbers 5, 13, 22, 23, 24), where a number of backward discriminant analyses permits a further characterization of *L. machangui* versus its neighboring taxa (correct classifications between 91.5 and 99.2%).

GENETIC CHARACTERIZATION

The partial cytochrome b sequencies of this species and the other *Lophuromys* taxa studied here can be accessed via http://home.bebif.be/muridae (TERRYN *et al.*, 2007).

8. 4. Description of *Lophuromys sabunii* n. sp. (OTU 31, Fig. 1)

HOLOTYPE

RMCA 96.037. M - 3796; young adult male (age class 1 and abdominal testes); collected by Jan STUYCK and Walter VERHEYEN (13 August 1995) in Mbizi on the Ufipa Plateau (07. 42°S - 31. 40°E; altitude ±1750 m; forest rim); collection number RUCA 13028; sequenced specimen.

PARATYPES

27 specimens (13 males, 13 females, 1 unassigned); age class 1 (5), age class 2 (17); age class 3 (3); age class 4 (2). All specimens were collected between 13 and 17 August 1995.

RMCA 96.037. M - 3789 (ad. ♀; alc. specimen; skull; coll. nr. 13001)
RMCA 96.037. M - 3790 (ad. ♀; alc. specimen; skull; coll. nr. 13002)
RMCA 96.037. M - 3791 (ad. ♂; alc. specimen; skull; coll. nr. 13003)
RMCA 96.037. M - 3793 (ad. ♂; alc. specimen; skull; coll. nr. 13010)
RMCA 96.037. M - 3794 (ad. ♀; alc. specimen; skull; coll. nr. 13018)
RMCA 96.037. M - 3795 (ad. ♂; alc. specimen; skull; coll. nr. 13021)
RMCA 96.037. M - 3797 (ad. ♀; alc. specimen; skull; coll. nr. 13029) sequenced specimen
RMCA 96.037. M - 3798 (ad. ? ; alc. specimen; skull; coll. nr. 13033)
RMCA 96.037. M - 3799 (ad. ♂; alc. specimen; skull; coll. nr. 13034)
RMCA 96.037. M - 3800 (ad. ♂; alc. specimen; skull; coll. nr. 13037)
RMCA 96.037. M - 3801 (ad. ♀; alc. specimen; skull; coll. nr. 13038)
RMCA 96.037. M - 3802 (ad. ♂; alc. specimen; skull; coll. nr. 13043
RMCA 96.037. M - 3803 (ad. ♀; alc. specimen; skull; coll. nr. 13044)
RMCA 96.037. M - 3804 (ad. ♀; alc. specimen; skull; coll. nr. 13045)

RMCA 96.037. M - 3805 (ad. ♀; alc. specimen; skull; coll. nr. 13086)
RMCA 96.037. M - 3806 (ad. ♀; alc. specimen; skull; coll. nr. 13088)
RMCA 96.037. M - 3807 (ad. ♂; alc. specimen; skull; coll. nr. 13089)
RMCA 96.037. M - 3808 (ad. ♂; alc. specimen; skull; coll. nr. 13090)
RMCA 96.037. M - 3809 (ad. ♀; alc. specimen; skull; coll. nr. 13129)
RMCA 96.037. M - 3810 (ad. ♂; alc. specimen; skull; coll. nr. 13130)
RMCA 96.037. M - 3812 (ad. ♂; alc. specimen; skull; coll. nr. 13133)
RMCA 96.037. M - 3813 (ad. ♂; alc. specimen; skull; coll. nr. 13165)
RMCA 96.037. M - 3814 (ad. ♂; alc. specimen; skull; coll. nr. 13170)
RMCA 96.037. M - 3815 (ad. ♀; alc. specimen; skull; coll. nr. 13188)
RMCA 96.037. M - 3816 (ad. ♂; alc. specimen; skull; coll. nr. 13189)
RMCA 96.037. M - 3820 (ad. ♀; alc. specimen; skull; coll. nr. 13218)
RMCA 96.037. M - 3826 (ad. ♀; alc. specimen; skull; coll. nr. 13254)

REMARK

The craniometric data of holotype and paratypes are shown in appendix, Table 13.

TYPE LOCALITY

All specimens were collected with snap traps (museum specials) by Jan STUYCK and Walter VERHEYEN in Mbizi on the Ufipa Plateau in biotopes ranging from the border of mountain forest over shrubby vegetation to agricultural plots around ±1750m altitude above sea level.

ETYMOLOGY

We dedicate this new taxon of "speckled" *Lophuromys* to Christopher Andrew SABUNI (Sokoine University of Agriculture, Morogoro, Tanzania).

DIAGNOSIS

L. sabunii is a new representative of the *L. flavopunctatus* species complex that can be easily defined through craniometry (Graphs 13 &14) and mtDNA sequencing (graph 10). Within the East African representative OTU's we selected OTU 8 (*L. laticeps*), OTU 30 (*L. machangui*) and OTU 25 (Mt Hannang) to characterize this new taxon.

EXTERNAL CHARACTERS (Tables 3. 2 & 4. 2)

As for all other OTUs in this study, there is no sexual dimorphism, neither in *L. sabunii* (OTU 31), nor in *L. laticeps* (OTU 8). Hence, the data for both sexes were lumped. *L. sabunii* has a significantly lower body weight (W) than *L. laticeps*, but is significantly bigger in TOL, HB, TL and HF. There is no difference in EL (ages 2+3).

UNIVARIATE CHARACTERIZATION (Table 7)

The skull of *L. sabunii* has about the same general size as *L. laticeps* (10 out of 24 measures give about the same values) (Table 7). However *L. sabunii* is consistently smaller for the rostrum dimensions M22 (ROHE) and M23 (ROBR), for the nasal measures (M15, M16), the depth of the upper incisor (M21), for zygomatic breadth M9 (ZYGO) and palatal breadth M10 (PALA); but consistently wider for M12 (UPDA), M13 (M1BR), M14 (ZYGP) and longer for M19 (BULL), M4 (HEPA), M5 (PAFL) and M7 (DIA2).

MULTIVARIATE CHARACTERIZATION (Graphs 13, 14; Table 9, functions 6, 14, 23, 25)

A forward canonical analysis between *L. laticeps* s. l. (OTU 8: Mutura), *L. machangui* (OTU 30: Mt Rungwe) and *L. sabunii* (OTU 31: Ufipa Plateau) yields a very small Wilks' Lambda and discards 3 out of the 24 available measures (graph 13). There is a small overlap between OTU 30 and OTU 31, but only 4 (2+2) out of 87 (55+32) specimens are involved. The percentage of correct classification totals 98.1 %.

An equally high classification level (99.2%) is obtained when making a forward canonical analysis between *L. machangui* (OTU 30: Mt Rungwe), *L. sabunii* (OTU 31: Ufipa Plateau) and *L. makundii* (OTU 25: Mt Hanang). In this case three out of 24 available measures were discarded, again Wilks' Lambda is very small and there is only a small overlap between OTU 31 and OTU 30, only one specimen of *L. sabunii* being classified in OTU 30 (Graph 14).

Also backward discriminant functions between *L. sabunii* (OTU 31, Ufipa Plateau) and *L. aquilus* [(appendix, table 9, function 6), *L. laticeps* (function 14), *L. machangui* (function 23) and *L. makundii* (function 25)] allow easy characterizations of individual skulls with a limited number of variables (2 - 7) and with very high percentages of correct classification (91. 4 - 100%).

GENETIC CHARACTERIZATION

The partial cytochrome b sequencies of this species and the other *Lophuromys* taxa studied here can be accessed via http://home.bebif.be/muridae (TERRYN *et al*., 2007).

8.5. Description of *Lophuromys makundii* n. sp. (OTU 25 + OTU 24, Fig. 1)

HOLOTYPE

RMCA 96. 037. M - 2325; adult scrotal male; collected by Jan STUYCK and Walter VERHEYEN (25 October 1987) in Gerodom (foot of Mount Hanang along a brook) (04. 28°S - 35. 23°E; at approximately 2000 meter above sea level); collection number RUCA 7366; sequenced specimen.

PARATYPES

19 specimens (9 males, 10 females); age class 2 (10); age class 3 (8); age class 4 (1); all collected between 24 and 27 October 1987.

SPECIMENS COLLECTED IN GERODOM (SITUATED ON THE FOOT OF MOUNT HANANG)

RMCA 96.037. M - 2312 (ad. ♂; alc. specimen; skull; coll. nr. 7281)
RMCA 96.037. M - 2324 (ad. ♂; alc. specimen; skull; coll. nr. 7362)
RMCA 96.037. M - 2326 (ad. ♂; alc. specimen; skull; coll. nr. 7369)
RMCA 96.037. M - 2327 (ad. ♀; alc. specimen; skull; coll. nr. 7371)
RMCA 96.037. M - 2328 (ad. ♀; alc. specimen; skull; coll. nr. 7388)

SPECIMENS COLLECTED ON MOUNT HANANG

RMCA 96.037. M - 2313 (ad. ♀; alc. specimen; skull; coll. nr. 7287)
RMCA 96.037. M - 2314 (ad. ♂; alc. specimen; skull; coll. nr. 7289)
RMCA 96.037. M - 2315 (ad. ♀; alc. specimen; skull; coll. nr. 7293)
RMCA 96.037. M - 2316 (ad. ♂; alc. specimen; skull; coll. nr. 7297)
RMCA 96.037. M - 2317 (ad. ♀; alc. specimen; skull; coll. nr. 7303)
RMCA 96.037. M - 2318 (ad. ♂; alc. specimen; skull; coll. nr. 7313)
RMCA 96.037. M - 2319 (ad. ♀; alc. specimen; skull; coll. nr. 7314)
RMCA 96.037. M - 2320 (ad. ♂; alc. specimen; skull; coll. nr. 7316)
RMCA 96.037. M - 2321 (ad. ♀; alc. specimen; skull; coll. nr. 7318)
RMCA 96.037. M - 2322 (ad. ♀; alc. specimen; skull; coll. nr. 7327)
RMCA 96.037. M - 2323 (ad. ♂; alc. specimen; skull; coll. nr. 7328)
RMCA 96.037. M - 2329 (ad. ♂; alc. specimen; skull; coll. nr. 7395)
RMCA 96.037. M - 2330 (ad. ♀; alc. specimen; skull; coll. nr. 7400)
RMCA 96.037. M - 2332 (ad. ♀; alc. specimen; skull; coll. nr. 7404)

REMARK

The craniometrical measurements of the holotype and the paratypes are summarized in Appendix 2, Table 14.

TYPE LOCALITY

All specimens were collected with snap traps (museum specials) by Jan STUYCK and Walter VERHEYEN in different biotopes (mountain forest, riparian vegetation, degraded forest, shrubby terrain, alpine vegetation) covering the slopes of Mount Hanang (between 2000 and 3400 m above sea level).

ETYMOLOGY

We dedicate this new species to Rhodes MAKUNDI (Sokoine University of Agriculture, Morogoro, Tanzania).

DIAGNOSIS

L. makundii is a new representative of the *L. flavopunctatus* species complex that can be easily defined through craniometry (Graphs 14, 15) and mtDNA sequencing (Graph 10). Amongst the OTU's that represent East African *Lophuromys* taxa, we selected OTU 8 (*L. laticeps*), OTU 30 (*L. machangui*), OTU 31 (*L. sabunii*) and OTU 23 (*L. verhageni*) to characterize this new species.

EXTERNAL CHARACTERS (Tables 3.1, 3.3 & 4.3)

L. makundii has a significantly lower body weight (W), hind foot length (HF) than *L. verhageni* (OTU 23), but a significantly higher tail length (TL). There are no significant differences in other external measurements between these two taxa. *L. makundii* (OTU 25) has a lower body weight (W) and head and body length (BH) than *L. aquilus* (OTU 50). There are no significant differences for tail length and hind foot length, and *L. makundii* specimens have significantly longer ears (EL). The OTU's in these comparisons show no sexual dimorphism; hence comparisons were made on the basis of groups including specimens from both sexes.

UNIVARIATE CHARACTERIZATION (Table 3.2, 4.1 & 7)

When compared with typical *L. laticeps*, the skull of *L. makundii* is slightly smaller: M1 (GRLS), M2 (PRCO) and M7 (DIA2), but clearly smaller for all the other measures resulting in a more slender silhouette: M8 (INTE), M9 (ZYGO), M20 (BRCA), M15 (BNAS), M10 (PALA), M18 (CHOB), M23 (ROBR). It is also characterized by its smaller molar dimensions: M11 (UPTE), M12 (UPDA), M13 (M1BR), M17 (LOTE) and more depressed rostrum: M22 (ROHE).

MULTIVARIATE CHARACTERIZATION (Graphs 14, 15; Appendix, Table 9, functions 7, 15, 24 & 25)

Both graphs represent forward canonical analyses permitting the characterization of *L. makundii* with high percentages of correct classification. When *L. makundii* is compared with *L. machangui* (OTU 30: Mt Rungwe) and *L. sabunii* (OTU 31: Ufipa plateau): three measures are discarded and the percentage of correct classification for *L. makundii* is 100% (Graph 14).

Graph 15 compares *L. makundii* with *L. verhageni* (OTU 23: Mt Meru) and *L. laticeps* (OTU 8: Mutura): seven measures are discarded and only one specimen is misclassified and in both analyses Wilks' Lambda is very low.

Also through a set of backward discriminant functions (Appendix, Table 9: functions 7, 15, 24, 25) *L. makundii* can easily be characterized versus its neighbouring taxa with high percentages of correct classification (98. 3% - 100%) and by the use of only 4 to 6 selected measures.

GENETIC CHARACTERIZATION

The partial cytochrome b sequencies of this species and the other *Lophuromys* taxa studied here can be accessed via http://home.bebif.be/muridae (TERRYN *et al*., 2007).

CONCLUSIONS

Researchers involved in the alpha systematics of Muridae are aware that the skull of a type specimen is one of the few sources that may allow the collecting of quantitative data (the skins and alcoholic type specimens give very limited information) that are sufficiently refined to allow meaningful comparisons with other, often freshly collected, specimens. Often, type skulls are damaged, especially in the oldest types. Therefore, the use of modern three-dimensional geomorphological methods is impossible, or very difficult. This constraint explains why we continue to use traditional measurements with calipers, and to base our analyses on a selection of 24 measures in order to obtain the maximum amount of shape related information from types, even when they are damaged.

An additional complication of working with type material (very often a single specimen) is that types sometimes belong to different sub-categories (sex and age) of a given species. We have attempted to address this problem by measuring larger series of skulls of some localities (topo-typical if possible). In order to maximize the reliability of our approach, that consists of using craniometrical measurements as a tool for taxonomical research, we compiled a number of Operational Taxonomical Units (OTU's) representing, as much as possible, the craniometrical variability over the entire geographic range of the studied species and populations.

Implemented on the *Lophuromys flavopunctatus* species complex, this approach has allowed us to link OTU's to specific types, to summarize the variation in craniometrical similarity within the studied taxa and to identify which OTU's cannot be linked to known taxa and might thus represent undescribed taxonomical entities (species). This phenetic approach is, at least for the present, the only practical method that allows to link historical taxa (type specimens) to specific OTU's thus preparing the field for DNA-sequencing as an identification tool for these small mammals (*on genetic distances among small mammals*: JOHNS & AVISE, 1998, *but see* FERGUSON, 2002). Indeed, through systematic plotting of skulls of sequenced specimens and specific types onto graphs representing canonical analyses of appropriate sets of OTU's, it will become possible to link "old" types to specific DNA barcodes.

ACKNOWLEDGEMENTS

The two expeditions to the Mt Kilimanjaro area to collect an adequate topo-typical series of *L. aquilus* were realized thanks to the support of our Tanzanian colleagues Prof. Dr. R. MAKUNDI and Dr. L. MULUNGU.). We also express our gratitude to the curators of the mammal collections of the museums who gave us access to type-specimens and collections in their care. Many colleagues have been very helpful, understanding and very patient. We particularly wish to thank M. CARLETON (Smithsonian Institution, National Museum of Natural History, Washington DC, USA), C. DENYS and M. TRANIER (Muséum National d'Histoire naturelle, Paris, France), F. DIETERLEN (Staatliches Museum für Naturkunde, Stuttgart, Germany), P. JENKINS (British Museum of Natural History, London, U. K.), S. MCLAREN (Carnegie Museum of Natural History, Pittsburgh, USA), G. MUSSER (American Museum of Natural History, New York, USA), B. PATTERSON and J. C. K. PETERHANS (Field Museum of Natural History, Chicago, USA), W. VAN NEER (Koninklijk Museum voor Midden Afrika, Tervuren, Belgium). We also acknowledge Tine DILLEN for her work in the molecular laboratory of the Royal Belgian Institute of Natural Sciences. Finally our gratitude also goes to our colleague Ron VERHAGEN for his technical and administrative assistance and support to finalize this work. This study was funded by FWO-V project 2. 0004. 91 and by a DWTC project entitled "Evaluating the effect of Pleistocene climate changes on speciation patterns in selected African vertebrates".

REFERENCES

BIBB, M.J. , VAN ETTEN, R.A. , WRIGHT, C.T. , WALBERG, M.W. & CLAYTON, D.A., 1981. Sequence and gene organization of mouse mitochondrial DNA. *Cell*, 26: 167-180.

CORTI, M., CASTIGLIA, R. & VERHEYEN, W., 2004. A note on three new cytotypes of *L. flavopunctatus* s. l. (Rodentia, Muridae) from Tanzania. *Mammalia,* 68 (1): 69-74.

DIETERLEN, F., 1976. Die afrikanische Muridengattung *Lophuromys* Peters, 1874. Vergleiche an Hand neuer Daten zur Morphologie, Oekologie und Biologie. *Stuttgarter Beiträge zur Naturkunde*, 285: 96 pp.

FERGUSON, J.W.H., 2002. On the use of genetic divergence for identifying species. *Biological Journal of the Linnean Society*, 75: 509-516.

JOHNS, G.C. & AVISE, J.C., 1998. A comparative summary of genetic distances in the vertebrates from the mitochondrial cytochrome b gene. *Molecular Biology and Evolution*, 15: 1481-1490.

HSU, T.C. & PATTON, J. L., 1969. Bone marrow preparations for chromosome studies. *In*: K. BENIRSCHKE (Ed.), Comparative Mammalian Cytogenetics, New York, Springer-Verlag, pp. 454-460.

KINGDON, J., 1974. East African mammals. An atlas of evolution in Africa. 2 (B). Hares and rodents. Academic Press, London & New York, 761 pp.

KOCHER, T.D., THOMAS, W.K. , MEYER, A. , EDWARDS, S.V. , PÄÄBO, S. , VILLABLANCA, F. X. & WILSON, A.C., 1989. Dynamics of mitochondrial DNA evolution in animals: Amplification and sequencing with conserved primers. *Proceedings of the National Academy of Sciences*, USA, 86: 6196-6200.

KUMAR, S., TAMURA, K., JAKOBSEN, I. B. & NEI, M., 2001. MEGA 2. 1: Molecular Evolutionary Genetic Analysis software. Arizona State University, Tempe, Arizona, USA.

LAVRENCHENKO, L.A., VERHEYEN, W.N. & HULSELMANS, J., 1998. Systematic and distributional notes on the *L. flavopunctatus* Thomas 1888 species-complex in Ethiopia (Muridae, Rodentia). *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie,* 68: 199-214.

LAVRENCHENKO, L.A., POTAPOV, S. G., LEBEDEV, V.S. & RYSKOV, A. P. , 2001. The phylogeny and systematics of the endemic Ethiopian *Lophuromys flavopunctatus* species complex based upon random amplified polymorphic DNA (RAPD) analysis. *Biochemical Systematics and Ecology*, 29: 1139-1151.

LAVRENCHENKO, L.A., VERHEYEN, E., POTAPOV, S.G., LEBEDEV, V.S., BULATOVA, N.SH., ANISKIN, V.M., VERHEYEN, W.N. & RYSKOV, A. P., 2004. Divergent and reticulate processes in evolution of Ethiopian *Lophuromys flavopunctatus* species complex: evidence from mitochondrial and nuclear DNA differentiation patterns. *Biological Journal of the Linnean Society*, 83: 301-316.

MUSSER, G.G. & CARLETON, M.D., 2005. Superfamily Muroidea. *In*: WILSON, D.E., REEDER, D.M. (Eds.), Mammal Species of the World: A Taxonomic and Geographic Reference, third edition, Johns Hopkins University Press, Baltimore, pp. 894-1531.

SNEATH, P.H.A. & SOKAL, R.R. , 1973. Numerical Taxonomy. W. H. Freeman & Co, San Francisco.

SOKAL, R.R. & ROHLF, F.J. 1969. Biometry. Freeman & Co, New York, USA, 1st ed.

SUZUKI, H., TSUCHIYIA, K., & TAKEZAKI, N., 2000. A molecular phylogenetic framework for the Ryuku endemic rodents *Tokudaia osimensis* and *Diplothrix legata*. *Molecular Phylogenetics and Evolution*, 15(1): 15–24.

SWOFFORD, D.L., 2004. PAUP: Phylogenetic Analysis Using Parsimony (& Other Methods) 4. 0 Beta. Smithsonian Institution, Washington D.C.

TERRYN, L., WENDELEN. W., LEIRS, H., LENGLET, G. & VERHEYEN E., 2007. African Rodentia http://home.bebif.be/muridae

TRUE, F.W., 1892. An Annotated Catalogue of the Mammals Collected by Dr. W. L. Abbott in the Kilimanjaro Region, East Africa. *Proceedings of the U. S. National Museum*, 15: 445-480.

VERHEYEN, W.N., COLYN, M. & HULSELMANS, J., 1996. Re-evaluation of the *Lophuromys nudicaudatus* Heller 1911 species complex, with a description of a new species from Zaire (Muridae, Rodentia). *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie*, 66: 241-273.

VERHEYEN, W.N., HULSELMANS, J., COLYN, M. & HÜTTERER, R., 1997. Systematics and zoogeography of the small mammal fauna of Cameroun: description of two new *Lophuromys* (Rodentia, Muridae) endemic to Mt Cameroun and Mt Oku. *Bulletin van het Koninklijk Belgische Instituut voor Natuurwetenschappen, Biologie*, 67: 163-186.

VERHEYEN, W.N., DIERCKX, T. & HULSELMANS, J., 2000. The brush-furred rats of Angola and southern Congo: Description of a new taxon of the *Lophuromys sikapusi* species complex. *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie*, 70: 253-267.

VERHEYEN, W.N., HULSELMANS, J., DIERICKX, T. & VERHEYEN, E., 2002. The *Lophuromys flavopunctatus* Thomas, 1888 s. l. species complex: a craniometric study, with the description and genetic characterization of two new species (Rodentia, Muridae, Africa). *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Biologie*, 72: 103-144.

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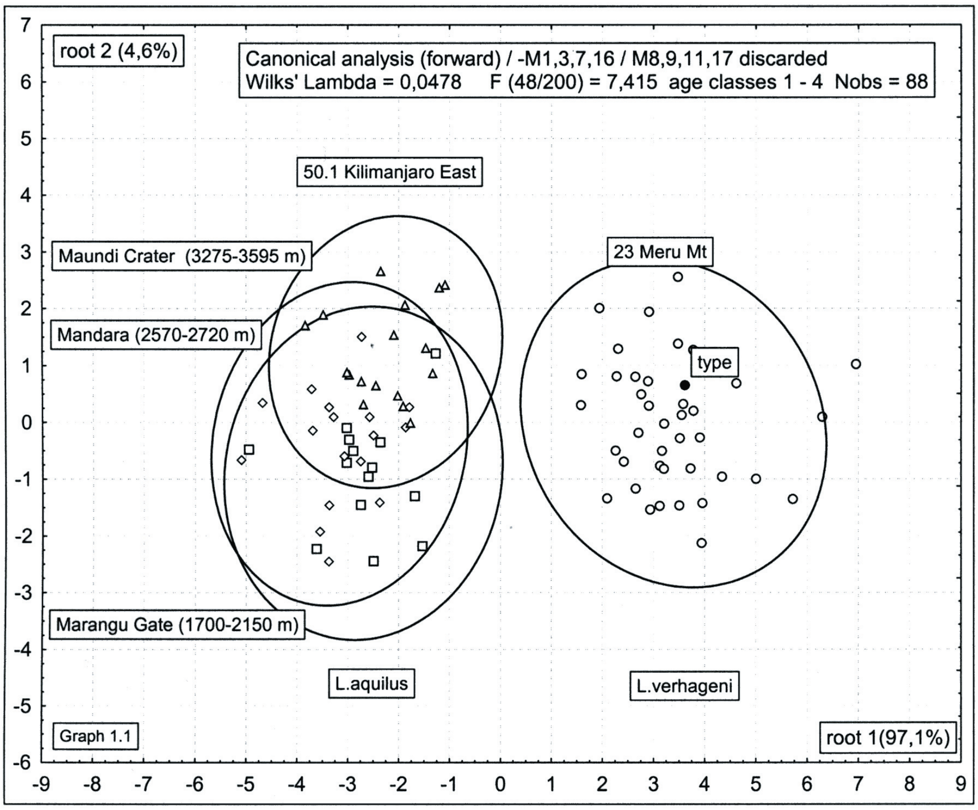
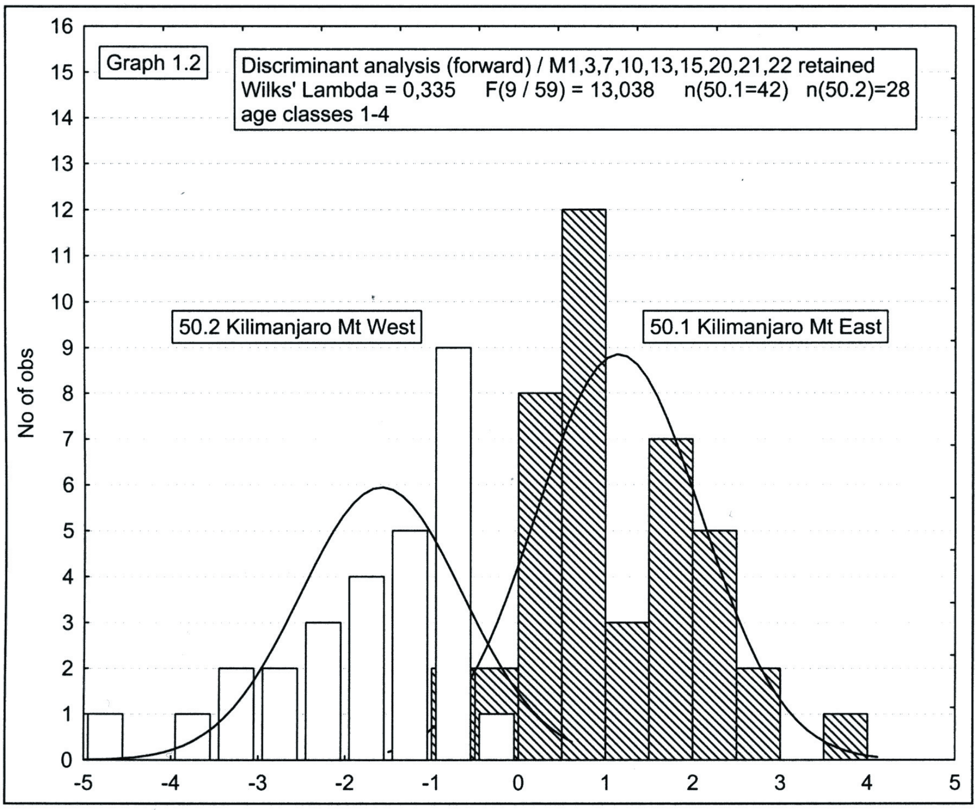
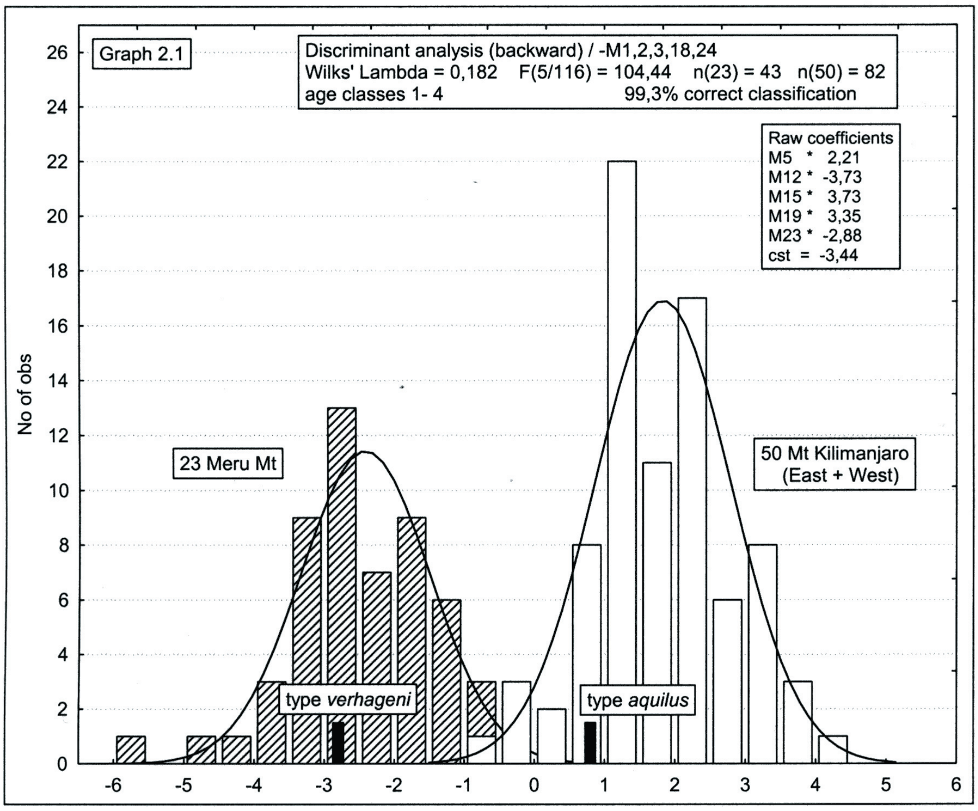
Graph 1. 1
Forward canonical analysis on a set of *Lophuromys* populations representing the East Kilimanjaro *aquilus* - population (OTU 50. 1) split up into 3 altitudinal groups versus *L. verhageni* from Mt Meru population (OTU 23).



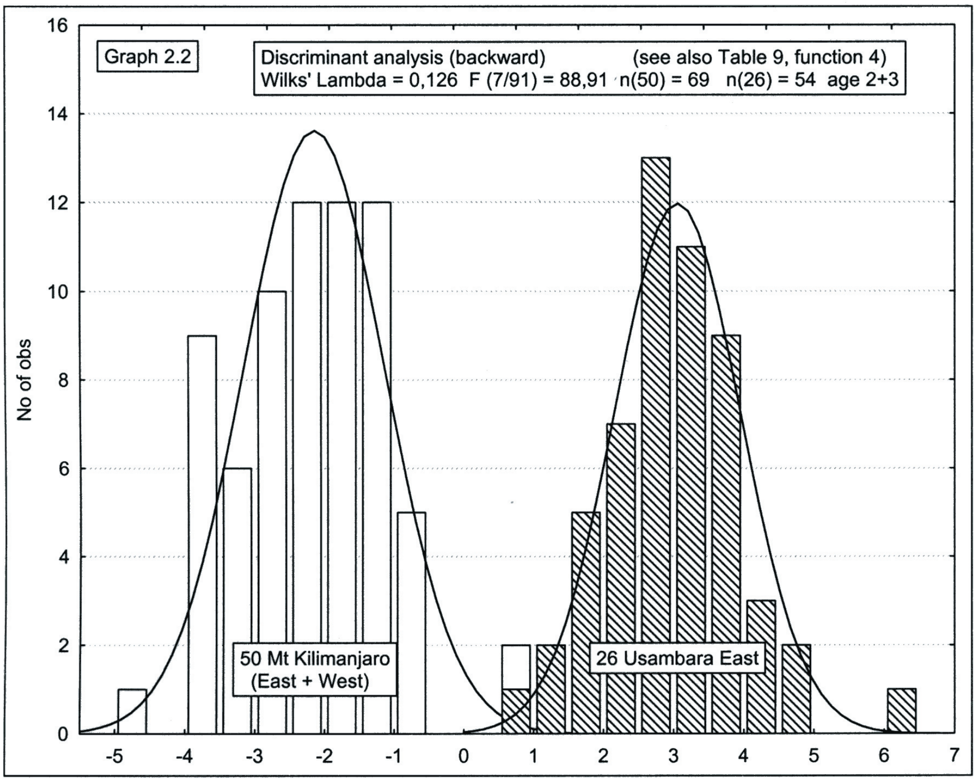
Graph 1. 2
Forward discriminant analysis between the *aquilus* population of East Kilimanjaro (OTU 50. 1) and West Kilimanjaro (OTU 50. 2) for age classes 1+2+3+4, males and females lumped.



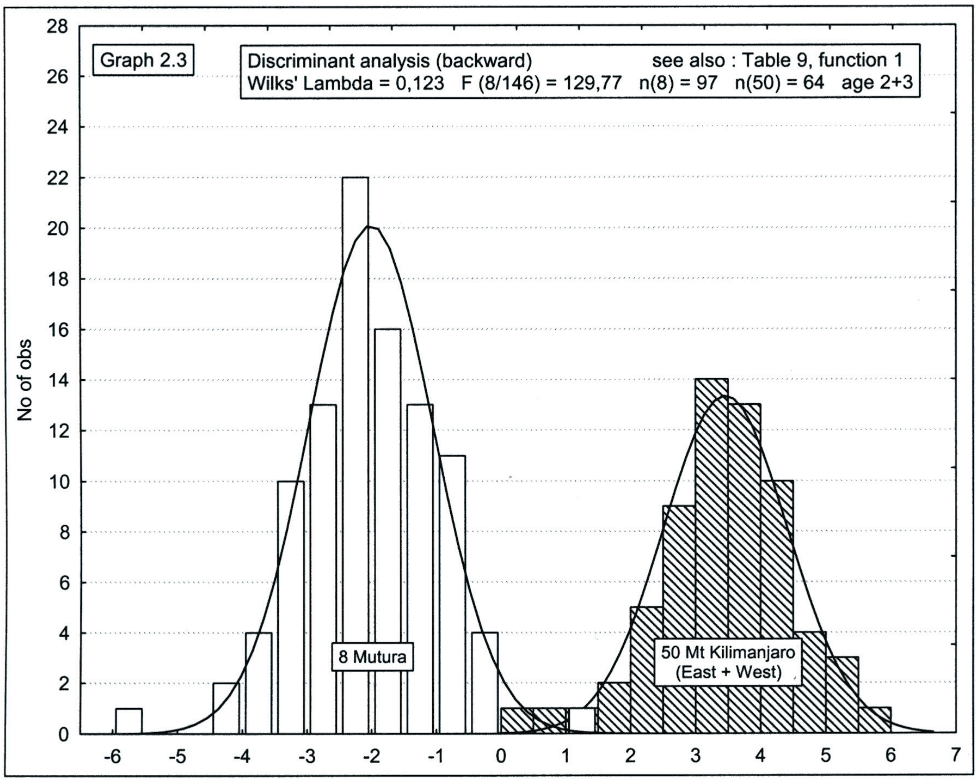
Graph 2. 1
Discriminant function (backward analysis), differentiating the *aquilus* population of Mt Kilimanjaro East + West (OTU 50) and *L. verhageni* from Mt Meru (age classes 1+2+3+4). This analysis was performed with a reduced set of cranial measurements to allow the plotting of the damaged type skull of *L. aquilus* True 1892.



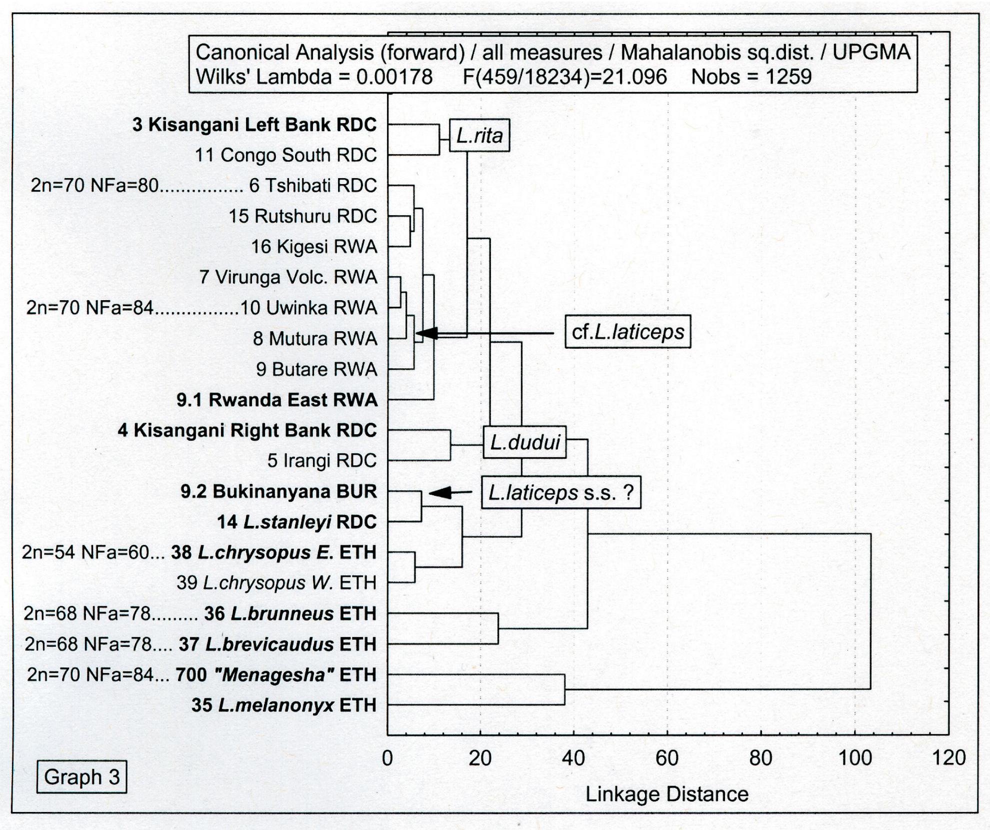
Graph 2. 2
Discriminant function (backward analysis), differentiating *L. aquilus* OTU 50 (Kilimanjaro East + West) and OTU 26. The raw canonical coefficients allow an 100 % correct diagnosis are also listed.



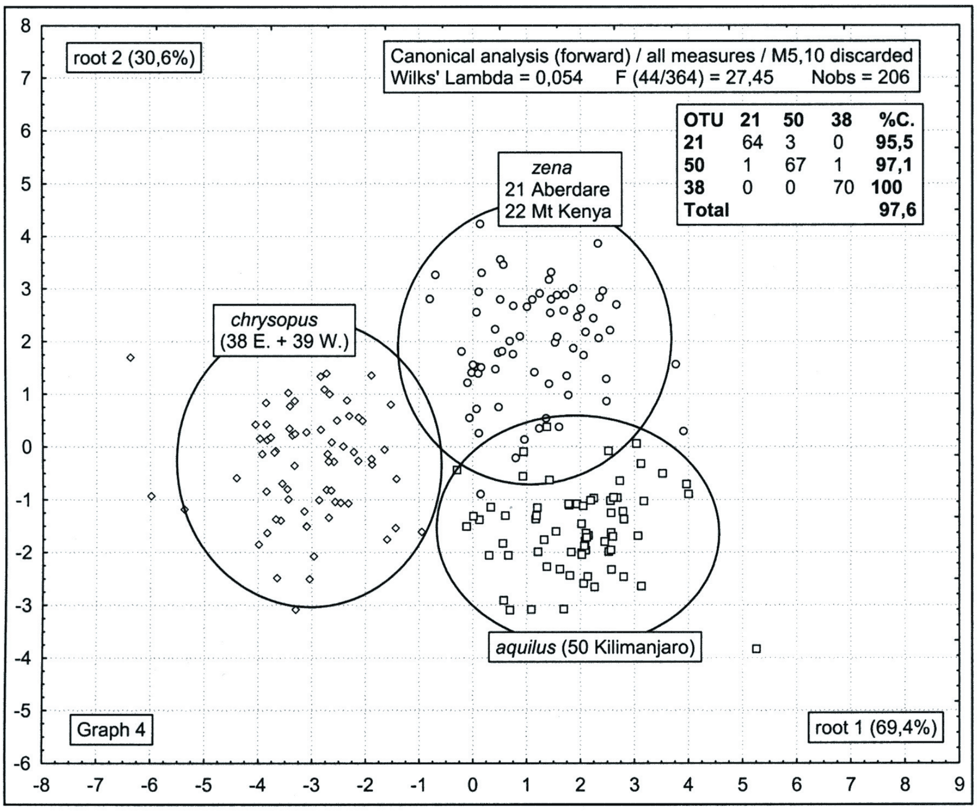
Graph 2. 3
Discriminant function (backward analysis), differentiating *L. aquilus* OTU 50 (Kilimanjaro East + West) and the typical series of *L. cf. laticeps* (OTU 8). The raw canonical coefficients that allow a 100 % correct diagnosis are also listed.



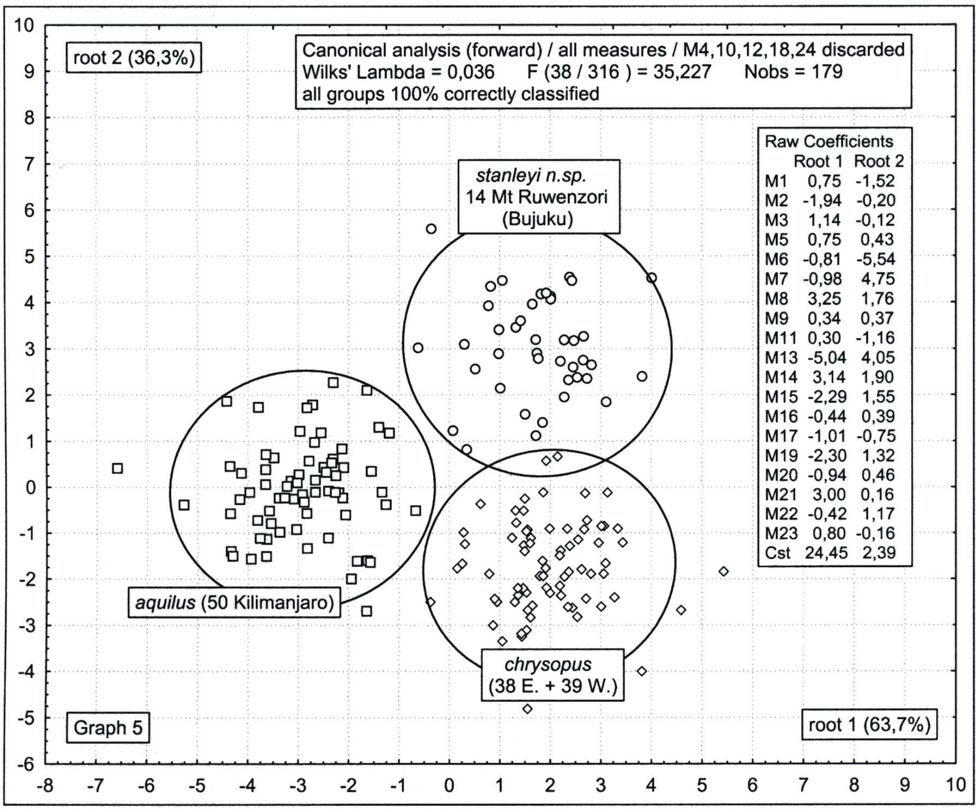
Graph 3
Canonical analysis that summarizes the craniometrical similarities among the studied OTU's (OTU number is always followed by locality and country information). Chromosomal data are linked to OTU's whenever a reliable link exists.



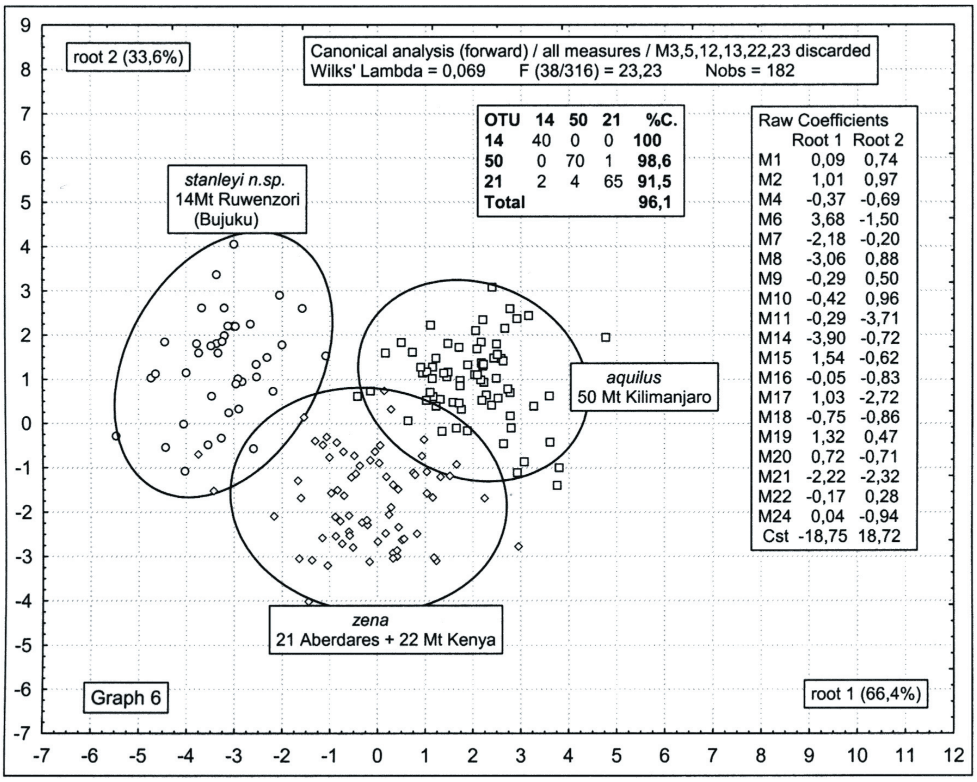
Graph 4
Canonical analysis (details see in box, including info on % of correct classification) separating *aquilus* (OTU 50) from *chrysopus* (OTU's 38 and 39) and *zena* (OTU's 21 and 22).



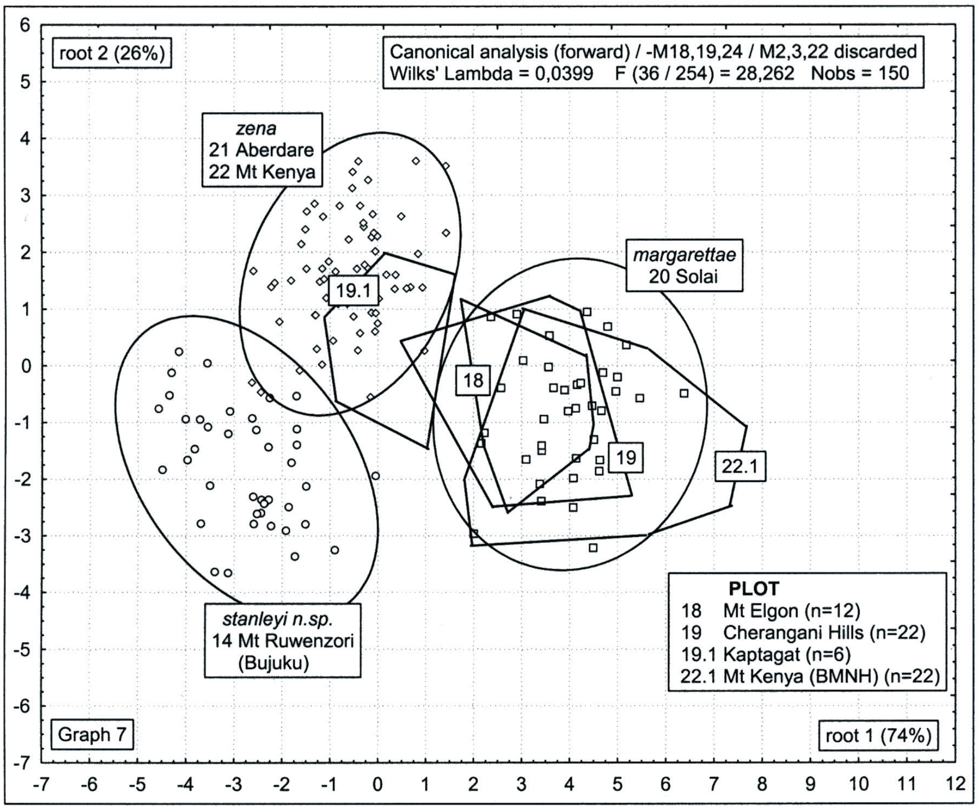
Graph 5
Canonical analysis (details see in box, including info on % of correct classification) separating *aquilus* (OTU 50) from OTU 14 and *chrysopus* (OTU's 38 and 39).

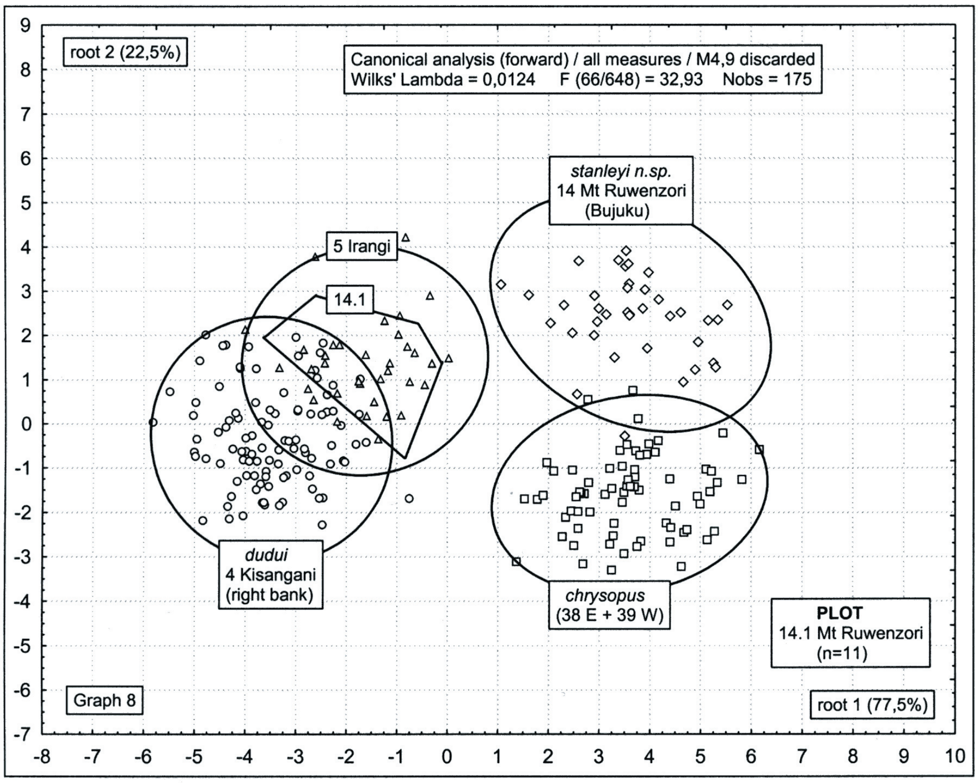


Graph 6
Canonical analysis (details see in box, including info on % of correct classification) separating *aquilus* (OTU 50) from OTU 14, and *zena* (OTU's 21 and 22).

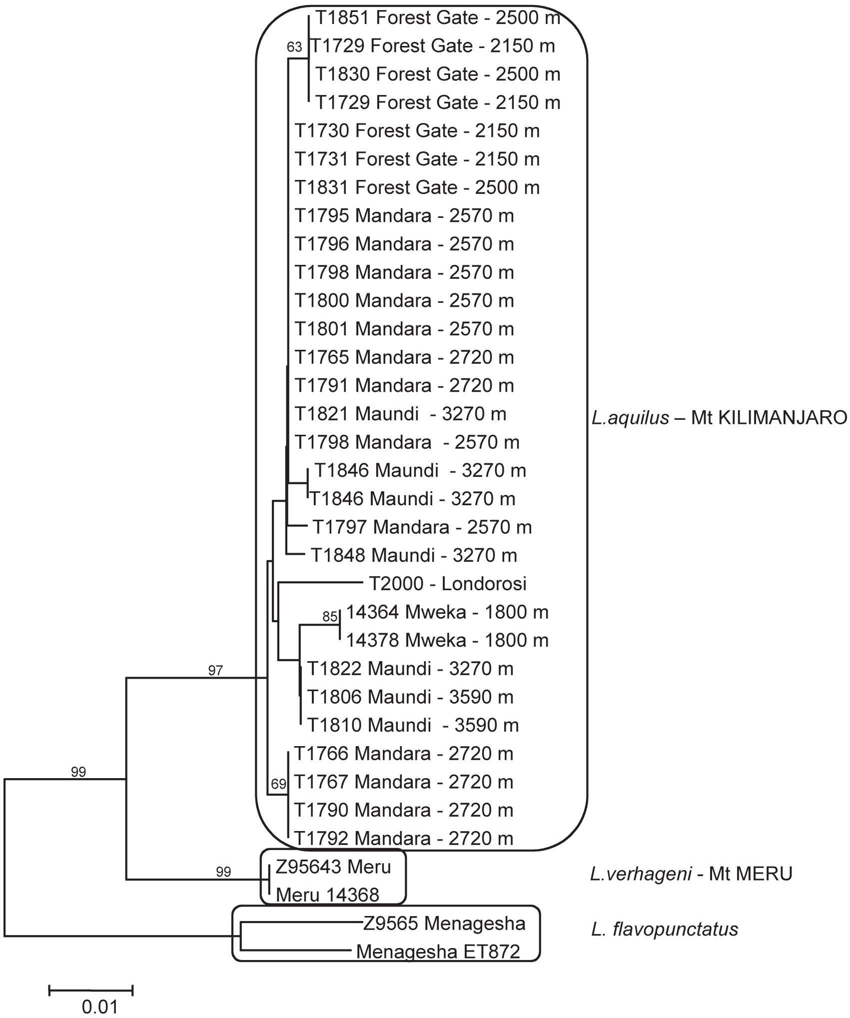


Graph 7
Canonical nalysis (details see in box, including info on % of correct classification) separating OTU 14, *zena* (OTU's 21 and 22) and *margarettae* (OTU 20).



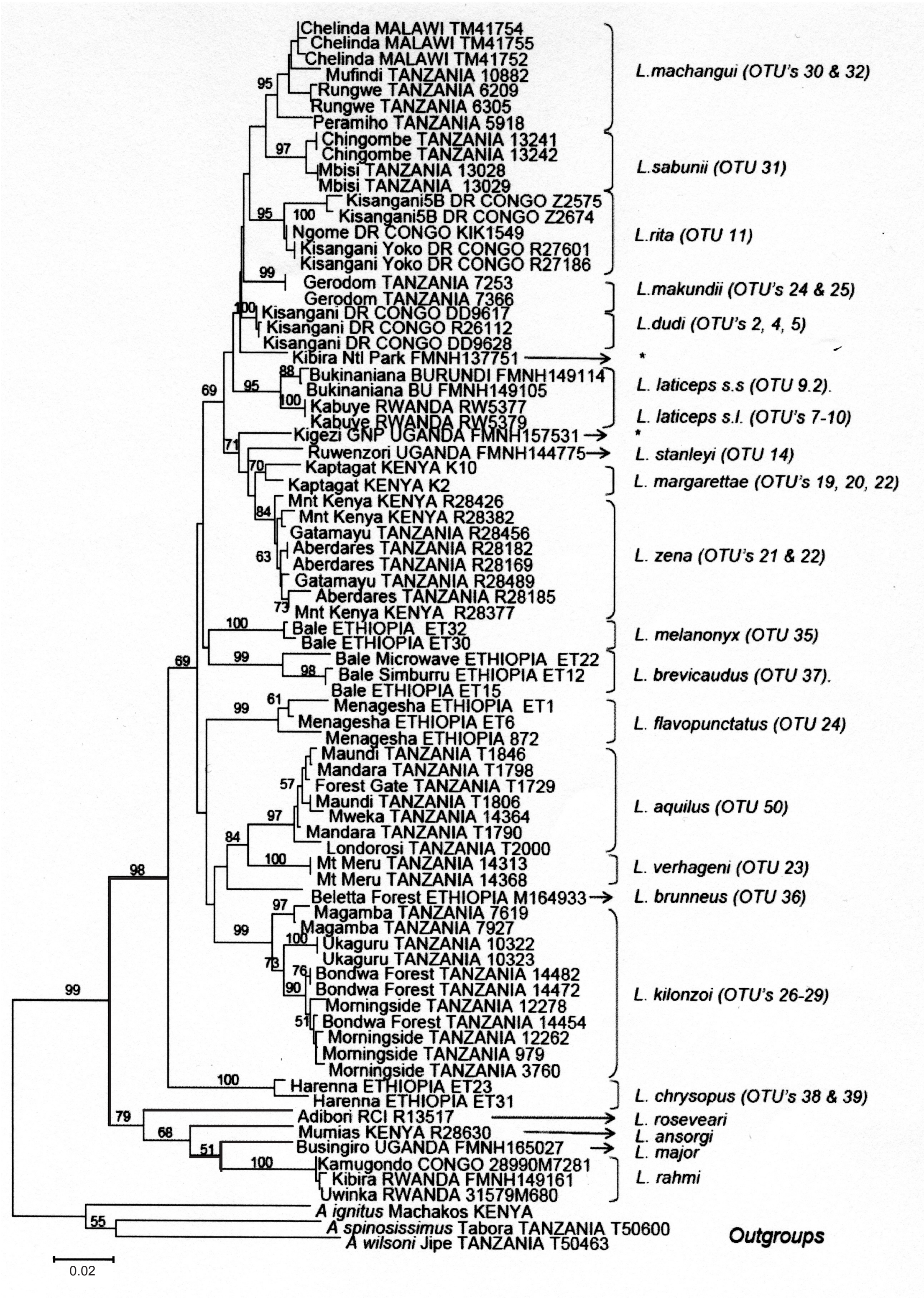


Graph 8
Canonical analysis (details see in box, including info on % of correct classification) separating *dudui* (OTU 4), OTU 14 and *margarettae* (OTU 20) and *chrysopus* (OTU's 38 and 39).

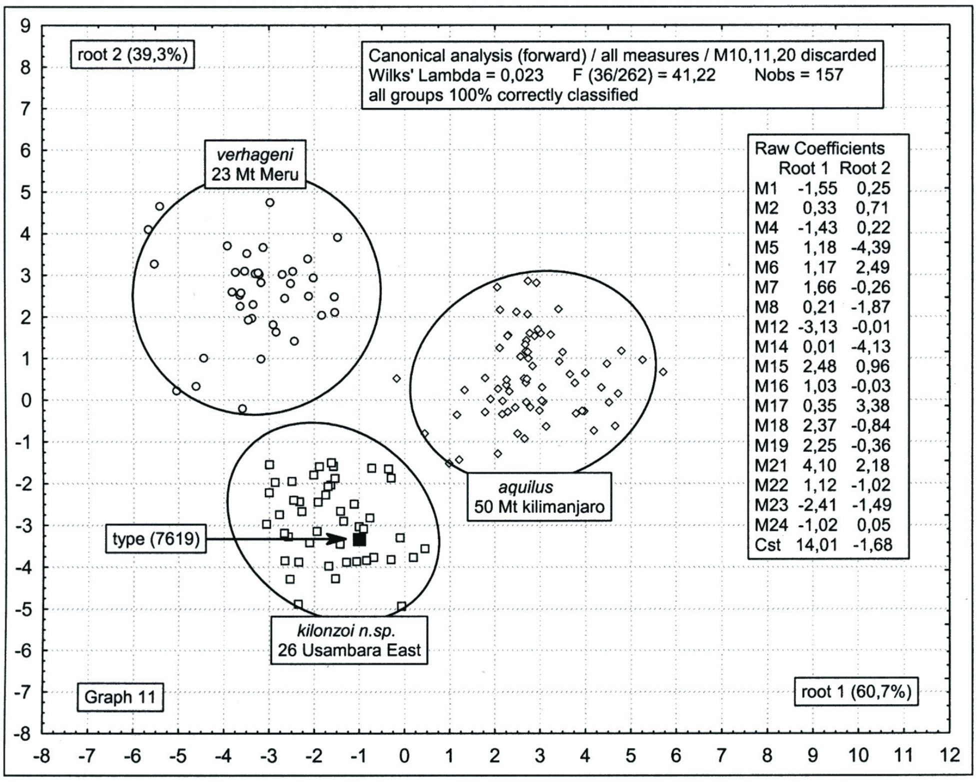


Graph 9
Neighbour joining tree (K2parameter, 1000 bootstrap replicates) based on cytochrome b sequences of a selection of *aquilus* specimens collected from various localities ad altitudes on the slopes of Mt Kilimanjaro. Combined with the craniometric data, the amount of variation (majority below 1%) indicates that Mt Kilimanjaro is occupied by a single taxon, *L. aquilus*.

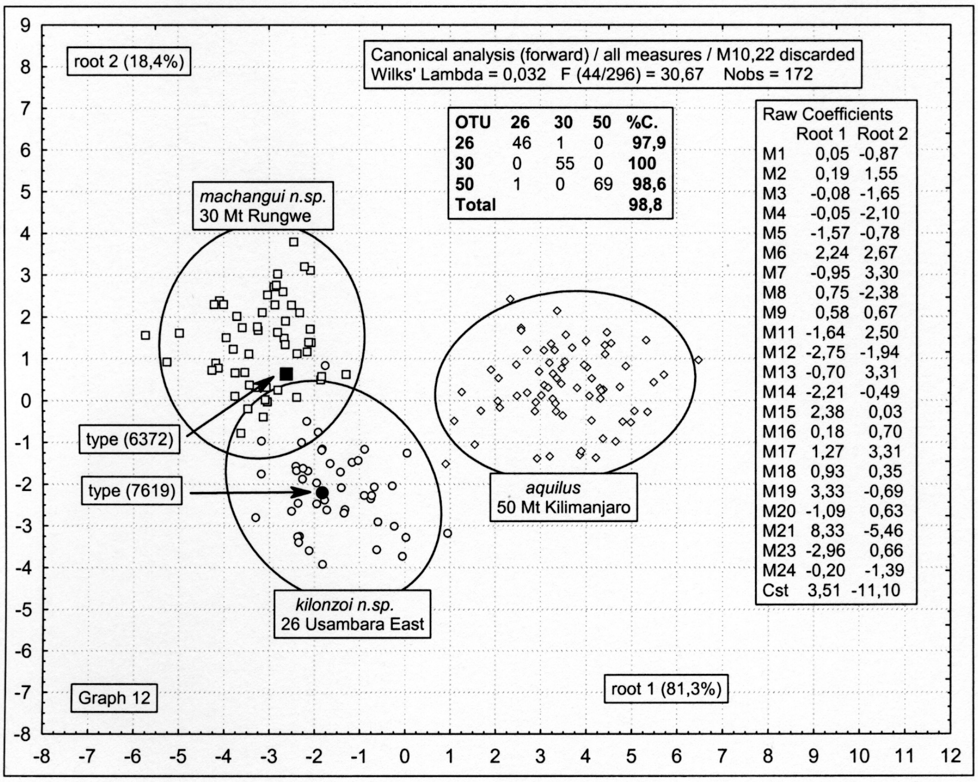
Graph 10
Neighbour joining tree (K2 parameter, 1000 bootstrap replicates) based on cytochrome b sequences of a selection of *Lophuromys* populations across East Africa. All taxa as identified using craniometric methods are resolved monophyletically, although in some cases the amount of sequence divergence with sister taxa is relatively low (p=0.025). For two localities a specimen was sequenced that could not be linked to known taxa (see asterisks).



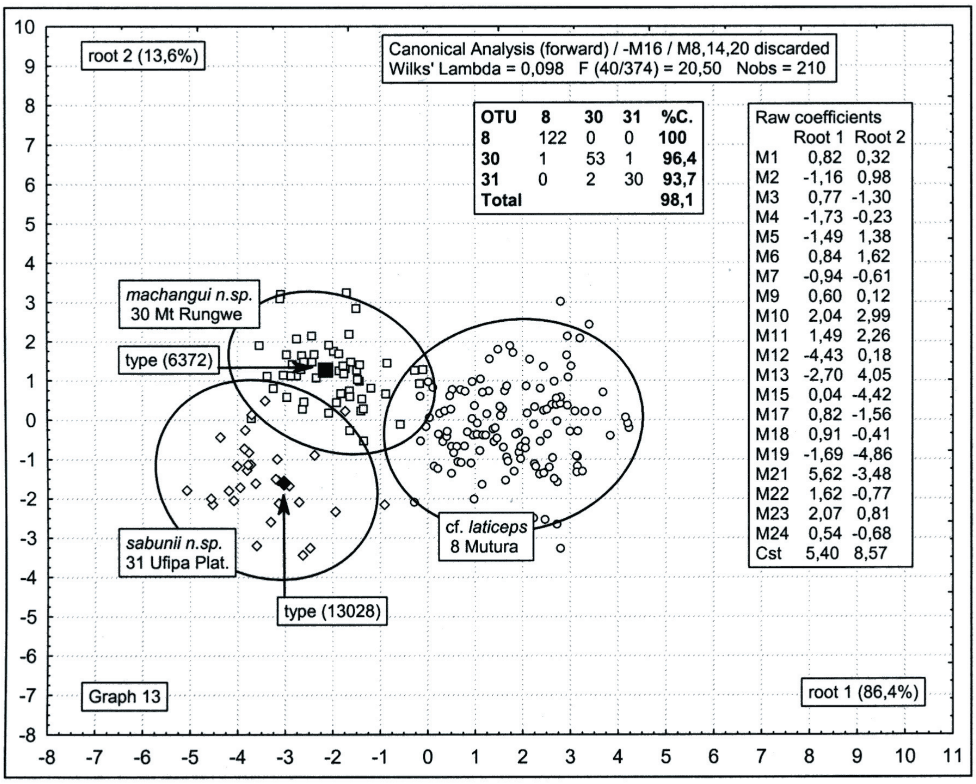
Graph 11
Canonical analysis (details see in box, including info on % of correct classification) separating *verhageni* (OTU 23), *kilozoi* (OTU 26) and *aquilus* (OTU 50). Whenever available, we plotted the relevant type specimens on the analysed OTU's.



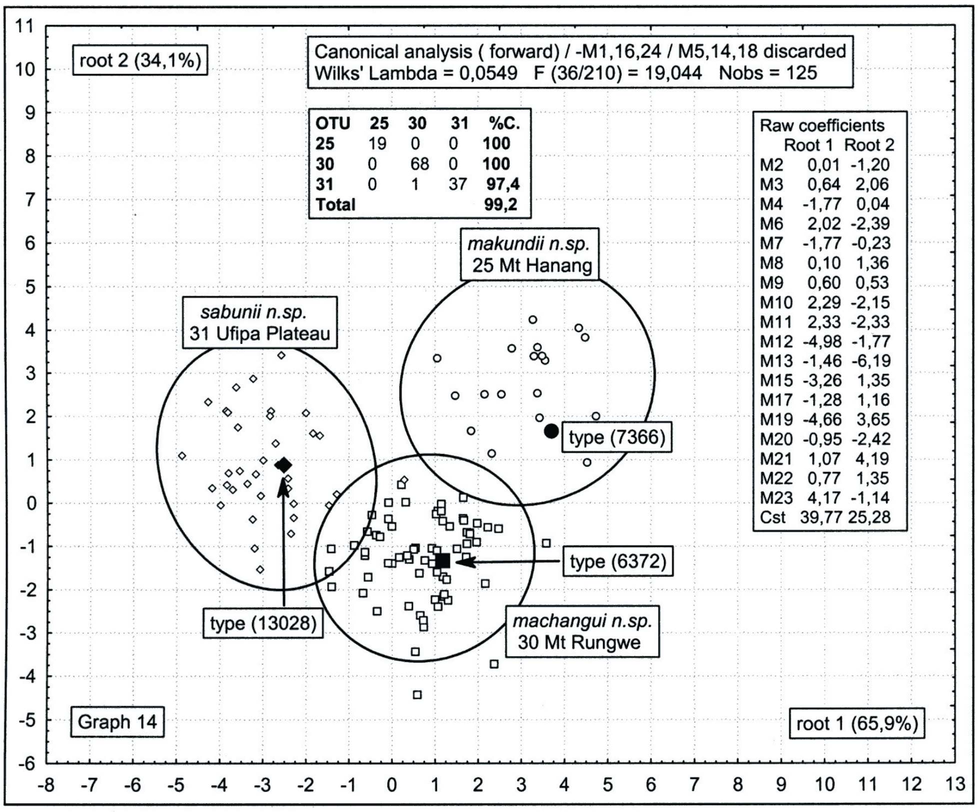
Graph 12
Canonical analysis (details see in box, including info on % of correct classification) separating *machangui* (OTU 30), *kilozoi* (OTU 26) and *aquilus* (OTU 50). Whenever available, we plotted the relevant type specimens on the analysed OTU's.



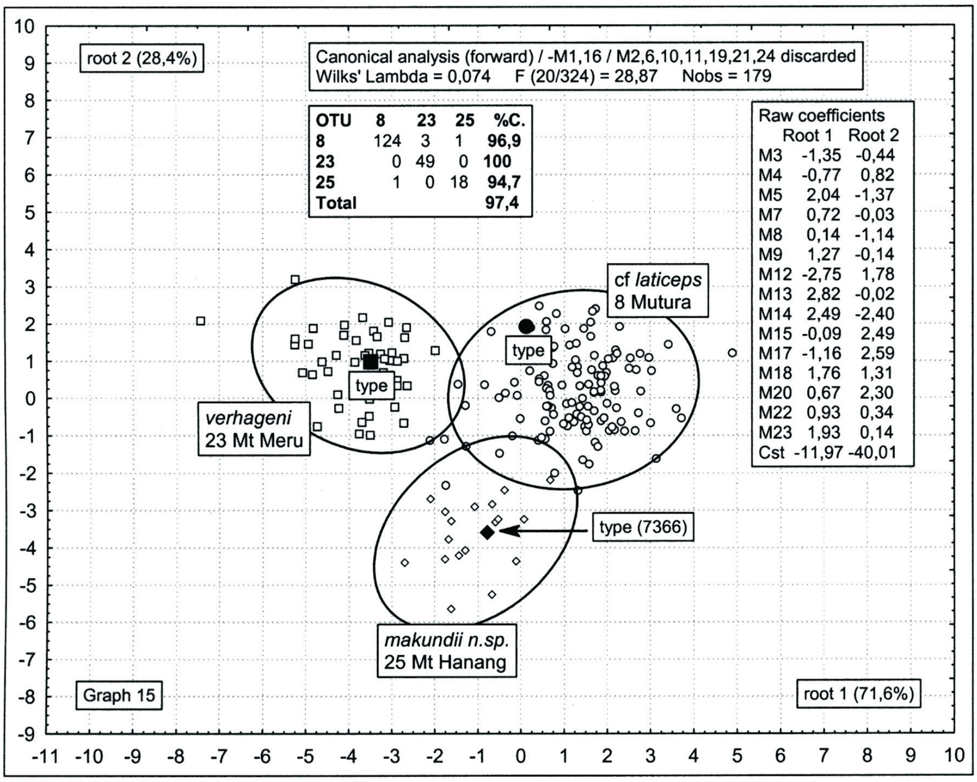
Graph 13
Canonical analysis (details see in box, including info on % of correct classification) separating *machangui* (OTU 30), *sabunii* (OTU 31) and *cf laticeps* (OTU 8). Whenever available, we plotted the relevant type specimens on the analysed OTU's.



Graph 14
Canonical analysis (details see in box, including info on % of correct classification) separating *machangui* (OTU 30), *sabunii* (OTU 31) and *makundii* (OTU 25). Whenever available, we plotted the relevant type specimens on the analysed OTU's.



Graph 15
Canonical analysis (details see in box, including info on % of correct classification) separating *verhageni* (OTU 23), *makundii* (OTU 25) and *cf laticeps* (OTU 8). Whenever available, we plotted the relevant type specimens on the analysed OTU's.



Graph 16
Canonical analysis (details see in box, including info on % of correct classification) suggest that entities within the *laticeps* group, from the Nyika plateau (OTU 32), Mufindi (OTU 28), Peramiho (OTU 29) overlap for their craniometrical genetic features and are not sufficiently differentiated from the Mt Rungwe (OTU 30) population to merit a separate taxonomical status.

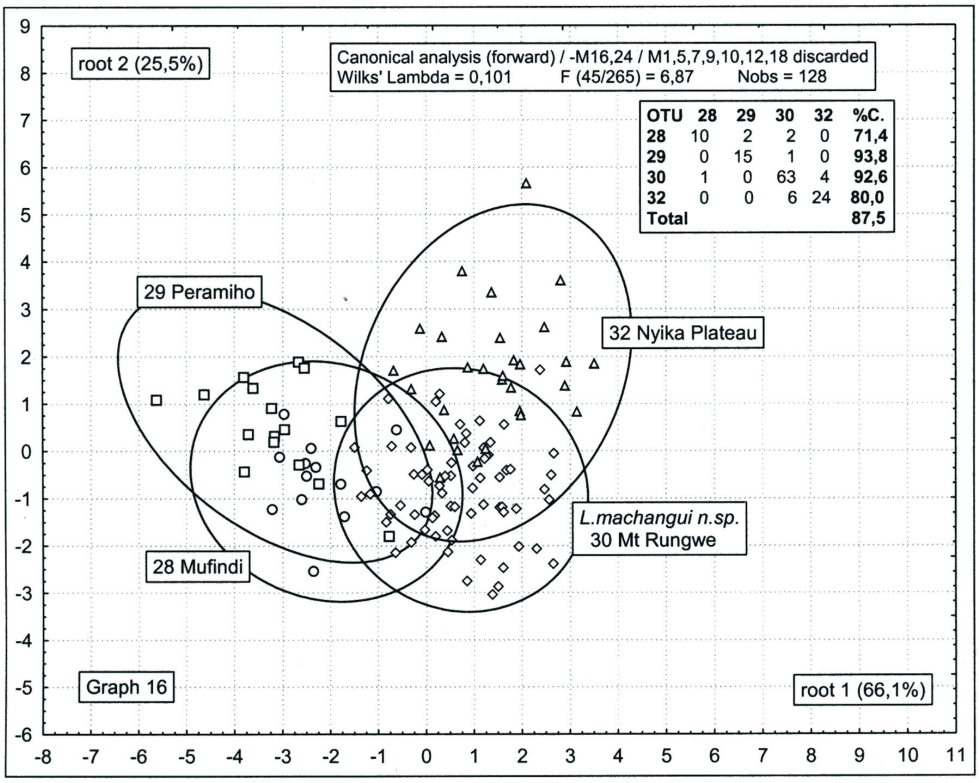


Table 2. 1. Basic statistics of craniometrical data of a *L. aquilus* population of East Kilimanjaro (OTU 50. 1), split into males and females to evaluate sexual dimorphism. Significance of the observed difference between the means (t-test of STUDENT) in the right column.

OTU 50.1 Kilimanjaro East (total

	Mean M	Mean F	age = 2 + 3 t-value	df	p	N(M)	N(F)	Sign.
M1	30.75	30.46	1.49	36	0.14	21	17	ns
M2	29.68	29.41	1.55	41	0.13	23	20	ns
M3	25.20	24.78	2.84	40	0.01	22	20	**
M4	12.76	12.61	1.45	41	0.16	23	20	ns
M5	6.44	6.36	1.21	41	0.23	23	20	ns
M6	8.39	8.34	0.61	41	0.55	23	20	ns
M7	9.90	9.77	1.43	40	0.16	23	19	ns
M8	6.05	6.00	1.07	41	0.29	23	20	ns
M9	14.72	14.70	0.11	41	0.91	23	20	ns
M10	3.03	3.10	-1.74	41	0.09	23	20	ns
M11	4.91	4.80	2.53	41	0.02	23	20	*
M12	6.66	6.64	0.38	41	0.70	23	20	ns
M13	1.70	1.67	1.36	41	0.18	23	20	ns
M14	2.82	2.84	-0.47	41	0.64	23	20	ns
M15	3.02	3.04	-0.46	41	0.65	23	20	ns
M16	12.76	12.68	0.67	36	0.51	21	17	ns
M17	4.36	4.29	1.69	41	0.10	23	20	ns
M18	1.48	1.50	-0.45	41	0.65	23	20	ns
M19	5.63	5.64	-0.25	41	0.80	23	20	ns
M20	12.78	12.86	-0.81	41	0.43	23	20	ns
M21	1.42	1.39	1.69	41	0.10	23	20	ns
M22	6.49	6.35	1.72	41	0.09	23	20	ns
M23	4.80	4.86	-1.45	41	0.16	23	20	ns
M24	8.70	8.48	2.42	41	0.02	23	20	*

Table 2. 2. Basic statistics of craniometrical data of an East Kilimanjaro population (OTU 50. 1), split up into age classes 2 and 3 to evaluate skull growth. Significance of the observed difference between the means (t-test of STUDENT) in the right column.

OTU 50.1 Kilimanjaro East (total)

	Age 2	Age 3	t-value	df	p	N(2)	N(3)	Sign.
M1	30.63	30.61	0.11	36	0.91	16	22	ns
M2	29.41	29.65	-1.27	41	0.21	17	26	ns
M3	24.88	25.09	-1.29	40	0.20	17	25	ns
M4	12.54	12.79	-2.52	41	0.02	17	26	*
M5	6.28	6.48	-3.23	41	0.00	17	26	**
M6	8.26	8.44	-2.38	41	0.02	17	26	*
M7	9.72	9.92	-2.06	40	0.05	16	26	*
M8	5.99	6.06	-1.31	41	0.20	17	26	ns
M9	14.62	14.77	-1.14	41	0.26	17	26	ns
M10	3.04	3.07	-0.71	41	0.48	17	26	ns
M11	4.84	4.87	-0.52	41	0.60	17	26	ns
M12	6.58	6.70	-2.49	41	0.02	17	26	*
M13	1.69	1.68	0.38	41	0.71	17	26	ns
M14	2.80	2.84	-0.77	41	0.44	17	26	ns
M15	2.99	3.05	-1.43	41	0.16	17	26	ns
M16	12.62	12.80	-1.47	36	0.15	16	22	ns
M17	4.34	4.32	0.60	41	0.55	17	26	ns
M18	1.46	1.50	-0.69	41	0.49	17	26	ns
M19	5.67	5.61	1.04	41	0.31	17	26	ns
M20	12.76	12.85	-0.99	41	0.33	17	26	ns
M21	1.38	1.42	-1.87	41	0.07	17	26	ns
M22	6.41	6.44	-0.36	41	0.72	17	26	ns
M23	4.80	4.85	-1.20	41	0.24	17	26	ns
M24	8.56	8.61	-0.49	41	0.63	17	26	ns

Table 2. 3. Univariate comparison between craniometrical data of Kilimanjaro East (OTU 50. 1) and Kilimanjaro West (OTU 50. 2). In the central column (sign.) we record the significance of the observed differences between the means (t-test of STUDENT).

OTU 50.1 Kilimanjaro East
M+F : age = 2+3

OTU 50.2 Kilimanjaro West
M+F : age 2+3

	N	Mean	Min	Max	SD	CV %	N	Mean	Min	Max	SD	CV %	Sign.	%DIff. Mean
M1	42	30.65	29.75	32.15	0.609	2.8	22	30.28	29.10	31.65	0.741	1.96	*	1.2
M2	46	29.50	28.55	31.05	0.591	3.1	23	29.41	27.85	31.00	0.920	2.01	ns	0.3
M3	45	24.97	24.05	26.35	0.526	3.4	23	24.94	23.35	26.40	0.862	2.10	ns	0.1
M4	47	12.65	11.70	13.45	0.364	3.7	23	12.50	11.80	13.60	0.493	2.65	ns	1.1
M5	47	6.40	5.95	6.95	0.219	4.9	23	6.19	5.70	6.60	0.243	3.44	***	3.3
M6	47	8.35	7.55	9.10	0.275	4.3	23	8.21	7.45	8.95	0.360	2.96	ns	1.6
M7	43	9.81	8.55	10.65	0.363	4.4	23	9.55	8.85	10.10	0.371	3.15	**	2.6
M8	47	6.01	5.40	6.40	0.205	3.1	23	6.07	5.65	6.45	0.231	2.89	ns	-1.1
M9	47	14.67	13.40	15.70	0.440	3.4	23	14.87	13.90	16.00	0.572	2.86	ns	-1.4
M10	47	3.06	2.80	3.45	0.151	5.1	23	3.11	2.80	3.35	0.146	4.66	ns	-1.5
M11	47	4.85	4.50	5.20	0.156	3.3	23	4.81	4.45	5.10	0.175	3.28	ns	0.8
M12	47	6.64	6.20	6.95	0.175	2.8	22	6.62	6.30	6.95	0.177	2.67	ns	0.3
M13	47	1.68	1.55	1.80	0.065	3.8	23	1.67	1.60	1.85	0.058	3.71	ns	0.4
M14	47	2.79	2.35	3.20	0.178	6.4	23	2.86	2.55	3.25	0.189	5.48	ns	-2.3
M15	47	3.01	2.70	3.30	0.141	4.3	23	3.00	2.65	3.25	0.199	4.19	ns	0.2
M16	43	12.67	11.50	13.55	0.438	4.1	22	12.54	11.80	13.75	0.547	3.12	ns	1.1
M17	47	4.31	4.05	4.65	0.129	3.1	23	4.38	4.20	4.75	0.133	2.92	*	-1.7
M18	47	1.48	1.15	1.75	0.172	11.2	23	1.40	1.20	1.70	0.124	11.51	ns	5.2
M19	47	5.61	5.25	6.05	0.177	3.0	23	5.68	5.35	6.00	0.168	3.19	ns	-1.3
M20	47	12.79	12.10	13.40	0.307	2.5	23	12.85	12.40	13.25	0.269	2.35	ns	-0.5
M21	47	1.39	1.10	1.55	0.082	5.8	23	1.34	1.20	1.45	0.068	5.12	*	3.5
M22	47	6.41	5.75	7.35	0.278	4.6	23	6.82	6.10	8.15	0.548	4.21	***	-6.4
M23	47	4.83	4.50	5.30	0.156	3.3	23	4.80	4.35	5.35	0.230	2.73	ns	0.7
M24	47	8.59	8.05	9.10	0.315	4.4	23	8.45	7.85	9.15	0.342	3.70	ns	1.6
W	47	55.0	38	80	7.46	13.6	22	51.4	36	71	9.43	18.3	ns	6.5
TOL	38	200.5	171	217	9.08	4.5	19	200.0	175	224	13.10	6.5	ns	0.2
HB	46	127.4	118	139	4.35	3.4	23	129.5	117	145	7.97	6.2	ns	-1.6
TL	35	75.2	67	84	4.61	6.1	19	72.0	55	84	8.49	11.8	ns	4.3
HF	46	22.3	21.0	24.0	0.68	3.0	23	21.7	20.3	23.5	0.77	3.5	**	2.6
EL	45	17.5	14.5	19.7	1.15	6.6	22	17.9	16.3	19.3	0.85	4.7	ns	-2.4

Table 3. 1. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. aquilus* (OTU 50).

	OTU 50 Kilimanjaro (East + West)					
L.aquilus	**M+F**	**age = 2 + 3**				
	N	**Mean**	**Min**	**Max**	**SD**	**CV %**
M1	64	30,52	29,10	32,15	0,675	2,2
M2	69	29,47	27,85	31,05	0,712	2,4
M3	68	24,96	23,35	26,40	0,653	2,6
M4	70	12,60	11,70	13,60	0,413	3,3
M5	70	6,33	5,70	6,95	0,246	3,9
M6	70	8,30	7,45	9,10	0,310	3,7
M7	66	9,72	8,55	10,65	0,383	3,9
M8	70	6,03	5,40	6,45	0,215	3,6
M9	70	14,74	13,40	16,00	0,492	3,3
M10	70	3,08	2,80	3,45	0,150	4,9
M11	70	4,84	4,45	5,20	0,162	3,4
M12	69	6,63	6,20	6,95	0,175	2,6
M13	70	1,67	1,55	1,85	0,062	3,7
M14	70	2,81	2,35	3,25	0,183	6,5
M15	70	3,00	2,65	3,30	0,161	5,4
M16	65	12,63	11,50	13,75	0,478	3,8
M17	70	4,34	4,05	4,75	0,134	3,1
M18	70	1,45	1,15	1,75	0,161	11,1
M19	70	5,63	5,25	6,05	0,176	3,1
M20	70	12,81	12,10	13,40	0,294	2,3
M21	70	1,38	1,10	1,55	0,081	5,9
M22	70	6,55	5,75	8,15	0,430	6,6
M23	70	4,82	4,35	5,35	0,182	3,8
M24	70	8,54	7,85	9,15	0,328	3,8
W	69	53,9	36	80	8,24	15,3
TOL	57	200,3	171	224	10,47	5,2
HB	69	128,1	117	145	5,83	4,6
TL	50	75,3	66	84	4,69	6,2
HF	69	22,1	20,3	24,0	0,76	3,4
EL	67	17,6	14,5	19,7	1,07	6,1

Table 3. 2. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. laticeps* (OTU 8).

	OTU 8 Mutura					
L.laticeps	**M+F**	**age = 2+3**				
	N	**Mean**	**Min**	**Max**	**SD**	**CV%**
M1	103	30,07	27,70	31,75	0,800	2,7
M2	103	28,61	26,35	30,30	0,808	2,8
M3	103	24,19	21,55	25,80	0,777	3,2
M4	103	12,06	11,00	13,00	0,421	3,5
M5	103	6,26	5,55	6,80	0,274	4,4
M6	103	7,80	6,85	8,50	0,313	4,0
M7	103	9,20	8,00	10,10	0,371	4,0
M8	103	6,05	5,55	6,55	0,215	3,6
M9	103	15,11	13,85	16,05	0,469	3,1
M10	103	3,14	2,65	3,60	0,187	5,9
M11	103	5,07	4,50	5,65	0,208	4,1
M12	103	6,76	6,30	7,30	0,201	3,0
M13	103	1,75	1,45	2,00	0,090	5,1
M14	103	2,87	2,40	3,40	0,191	6,7
M15	103	2,90	2,60	3,25	0,144	5,0
M16	103	12,18	11,00	13,40	0,513	4,2
M17	103	4,47	3,90	4,90	0,185	4,1
M18	102	1,40	0,90	1,85	0,189	13,5
M19	97	5,20	4,75	5,85	0,198	3,8
M20	103	13,03	12,40	13,80	0,287	2,2
M21	103	1,28	1,10	1,50	0,090	7,0
M22	103	6,61	5,65	7,25	0,325	4,9
M23	103	5,47	4,80	6,20	0,312	5,7
M24	102	8,69	7,85	9,50	0,335	3,9
W	96	59,2	43	73	6,88	11,6
TOL	72	179,9	157	199	8,69	4,8
HB	96	115,0	99	136	6,23	5,4
TL	73	65,9	54	76	4,70	7,1
HF	95	21,1	19,1	23,3	0,69	3,3
EL	93	17,0	15,1	18,6	0,75	4,4

Table 3. 3. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. verhageni* (OTU 23).

	OTU 23 Mt Meru					
L.verhageni	**M+F**	**age = 2 + 3**				
	N	**Mean**	**Min**	**Max**	**SD**	**CV %**
M1	37	30,43	28,95	31,60	0,689	2,3
M2	37	29,25	27,55	30,60	0,709	2,4
M3	37	24,90	23,55	26,25	0,675	2,7
M4	39	12,58	11,85	13,20	0,323	2,6
M5	39	5,92	5,30	6,45	0,285	4,8
M6	39	7,92	7,15	8,45	0,297	3,7
M7	39	9,33	8,40	9,90	0,341	3,7
M8	39	5,91	5,60	6,40	0,190	3,2
M9	38	14,66	13,95	15,40	0,377	2,6
M10	39	3,13	2,70	3,50	0,182	5,8
M11	39	5,04	4,65	5,55	0,211	4,2
M12	39	6,89	6,60	7,20	0,154	2,2
M13	39	1,76	1,65	1,95	0,072	4,1
M14	39	2,70	2,40	3,05	0,138	5,1
M15	39	2,83	2,60	3,05	0,111	3,9
M16	38	12,11	11,30	13,10	0,446	3,7
M17	39	4,58	4,25	4,85	0,141	3,1
M18	39	1,26	0,90	1,45	0,130	10,4
M19	39	5,25	4,90	5,90	0,223	4,2
M20	39	12,77	12,20	13,15	0,218	1,7
M21	39	1,25	1,15	1,45	0,082	6,5
M22	39	6,30	5,85	6,75	0,201	3,2
M23	39	4,98	4,55	5,30	0,168	3,4
M24	31	8,83	8,20	9,35	0,260	2,9
W	37	53,2	40	64	6,06	11,4
TOL	36	194,0	158	221	12,67	6,5
HB	37	126,2	112	140	6,58	5,2
TL	33	70,1	43	81	6,21	8,9
HF	35	22,5	21,0	23,5	0,65	2,9
EL	36	18,7	14,3	22,0	1,77	9,4

Table 3. 4. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. kilonzoi* n. sp (OTU 26).

	OTU 26 Usambara East					
L.kilonzoi n.sp.	**M+F**	**age = 2+ 3**				
	N	**Mean**	**Min**	**Max**	**SD**	**CV %**
M1	45	30,06	28,40	31,25	0,708	2,4
M2	54	28,68	27,05	30,20	0,764	2,7
M3	50	24,40	22,80	25,80	0,674	2,8
M4	54	12,28	11,50	13,15	0,341	2,8
M5	54	6,45	5,95	6,85	0,239	3,7
M6	54	7,74	7,10	8,35	0,297	3,8
M7	54	9,13	8,45	9,80	0,372	4,1
M8	54	6,09	5,65	6,50	0,179	2,9
M9	53	14,73	13,70	15,85	0,491	3,3
M10	54	3,14	2,70	3,55	0,177	5,6
M11	54	4,93	4,65	5,20	0,139	2,8
M12	54	6,80	6,45	7,30	0,226	3,3
M13	54	1,74	1,55	1,90	0,082	4,7
M14	54	2,95	2,55	3,40	0,166	5,6
M15	54	2,76	2,55	3,05	0,132	4,8
M16	46	12,04	10,85	12,85	0,470	3,9
M17	54	4,33	4,05	4,60	0,124	2,9
M18	54	1,40	1,00	1,75	0,177	12,7
M19	54	5,28	4,90	5,70	0,199	3,8
M20	54	12,81	12,25	13,40	0,267	2,1
M21	54	1,29	1,15	1,50	0,076	5,9
M22	54	6,31	5,80	6,85	0,264	4,2
M23	54	5,02	4,50	5,40	0,194	3,9
M24	54	8,72	8,10	9,55	0,339	3,9
W	51	54,5	40	74	6,94	12,7
TOL	42	201,0	175	224	11,95	5,9
HB	52	126,3	115	139	6,06	4,8
TL	42	75,3	50	94	9,73	12,9
HF	50	21,7	19,1	23,9	0,97	4,5
EL	51	19,1	15,5	21,7	1,34	7,0

Table 4. 1. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. machangui* n. sp (OTU 25).

			OTU 30 Mt Rungwe			
L.machangui n.sp.			M+F	age = 2+3		
	N	Mean	Min	Max	SD	CV %
M1	53	29,71	28,10	31,30	0,765	2,6
M2	63	28,50	27,10	31,05	0,824	2,9
M3	62	24,10	22,70	26,05	0,763	3,2
M4	63	12,20	11,45	13,30	0,425	3,5
M5	63	6,43	5,75	6,95	0,278	4,3
M6	63	7,87	7,40	8,60	0,279	3,5
M7	63	9,36	8,85	10,25	0,321	3,4
M8	63	5,91	5,50	6,35	0,194	3,3
M9	63	14,61	13,40	15,90	0,488	3,3
M10	63	3,11	2,75	3,50	0,183	5,9
M11	63	5,04	4,65	5,45	0,211	4,2
M12	63	6,86	6,55	7,40	0,208	3,0
M13	63	1,79	1,65	2,00	0,072	4,1
M14	63	2,97	2,55	3,40	0,185	6,2
M15	63	2,73	2,45	3,00	0,116	4,2
M16	55	12,16	11,20	13,40	0,493	4,1
M17	63	4,44	4,10	4,80	0,156	3,5
M18	63	1,37	0,95	1,75	0,156	11,5
M19	63	5,15	4,85	5,45	0,132	2,6
M20	63	12,85	12,25	13,40	0,269	2,1
M21	63	1,20	1,05	1,35	0,067	5,5
M22	63	6,21	5,70	7,00	0,258	4,2
M23	63	5,03	4,60	5,50	0,191	3,8
M24	61	8,44	7,80	9,65	0,423	5,0
W	63	52,3	38	84	8,93	17,1
TOL	58	187,7	153	216	13,21	7,0
HB	63	123,4	105	137	6,92	5,6
TL	58	64,3	24	81	12,08	18,8
HF	61	20,9	17,6	22,7	0,92	4,4
EL	58	16,9	13,4	19,1	1,03	6,1

Table 4. 2. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. sabunii* n. sp (OTU 31).

			OTU 31 Ufipa Plateau			
L.sabunii n.sp.		M+F	age = 2+3			
	N	Mean	Min	Max	SD	CV %
M1	25	30,17	28,85	31,70	0,731	2,4
M2	29	28,77	27,40	30,65	0,854	3,0
M3	28	24,43	23,05	26,05	0,802	3,3
M4	30	12,41	11,30	13,35	0,453	3,7
M5	30	6,42	5,90	6,85	0,260	4,0
M6	30	7,79	7,20	8,35	0,300	3,8
M7	30	9,35	9,00	10,00	0,301	3,2
M8	30	6,02	5,75	6,75	0,216	3,6
M9	30	14,77	14,00	16,00	0,536	3,6
M10	30	3,00	2,65	3,35	0,171	5,7
M11	30	5,04	4,60	5,45	0,206	4,1
M12	29	6,96	6,50	7,45	0,199	2,9
M13	30	1,83	1,60	1,95	0,073	4,0
M14	30	3,00	2,55	3,25	0,165	5,5
M15	30	2,81	2,40	3,10	0,161	5,7
M16	25	11,94	10,80	13,30	0,581	4,9
M17	30	4,52	4,10	4,80	0,151	3,3
M18	30	1,34	1,05	1,70	0,162	12,1
M19	30	5,48	5,15	5,80	0,188	3,4
M20	30	13,00	12,50	13,75	0,308	2,4
M21	30	1,23	1,15	1,40	0,068	5,5
M22	30	6,25	5,75	6,70	0,218	3,5
M23	30	4,84	4,40	5,15	0,185	3,8
M24	30	8,69	8,00	9,55	0,339	3,9
W	29	52,0	38	87	10,31	19,8
TOL	25	199,1	142	219	14,46	7,3
HB	29	127,7	112	145	7,35	5,8
TL	25	72,7	30	88	10,06	13,8
HF	28	21,7	20,0	22,9	0,70	3,2
EL	28	16,9	12,2	19,5	1,47	8,7

Table 4. 3. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. makundii* n. sp (OTU 25).

OTU 25 Mt Hanang						
L.makundii n.sp.		M+F	age = 2+3			
	N	Mean	Min	Max	SD	CV %
M1	15	29,46	27,6	30,85	0,823	2,8
M2	19	28,21	26,3	29,8	0,765	2,7
M3	18	24,01	22,2	25,55	0,738	3,1
M4	19	12,01	11,55	12,5	0,283	2,4
M5	19	6,26	6,05	6,55	0,154	2,5
M6	19	7,71	7,3	8,2	0,284	3,7
M7	19	8,98	8,3	9,8	0,384	4,3
M8	19	5,79	5,35	5,95	0,153	2,6
M9	19	14,12	13,4	15,2	0,471	3,3
M10	19	2,90	2,55	3,45	0,208	7,2
M11	19	4,81	4,4	5	0,158	3,3
M12	19	6,42	6,25	6,85	0,158	2,5
M13	19	1,68	1,55	1,75	0,063	3,8
M14	19	2,86	2,6	3,1	0,149	5,2
M15	19	2,63	2,35	2,9	0,121	4,6
M16	16	11,98	11,3	12,6	0,364	3,0
M17	19	4,16	3,9	4,35	0,105	2,5
M18	19	1,16	0,9	1,35	0,108	9,4
M19	19	5,21	5	5,65	0,136	2,6
M20	19	12,24	11,75	12,7	0,285	2,3
M21	19	1,25	1,2	1,35	0,047	3,8
M22	19	6,17	5,85	6,5	0,230	3,7
M23	19	4,98	4,65	5,4	0,220	4,4
M24	19	8,56	7,95	9,15	0,319	3,7
W	19	48,8	33	58	6,12	12,6
TOL	17	201,4	187	212	6,34	3,2
HB	19	124,9	118	134	4,26	3,4
TL	17	76,3	59	85	6,29	8,2
HF	19	21,9	21,0	23,1	0,61	2,8
EL	19	18,8	16,5	20,7	1,23	6,5

Table 4. 4. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. stanleyi* n. sp (OTU 14).

OTU 14 Mt Ruwenzori						
L.stanleyi n.sp.	M+F	age = 2+ 3				
	N	Mean	Min	Max	SD	CV%
M1	31	28,90	26,90	30,15	0,684	2,4
M2	32	27,57	25,00	29,10	0,713	2,6
M3	32	23,40	21,10	25,00	0,649	2,8
M4	32	11,79	10,60	12,45	0,372	3,2
M5	32	5,91	5,45	6,60	0,294	5,0
M6	32	7,48	6,50	8,10	0,311	4,2
M7	32	9,08	7,75	9,75	0,392	4,3
M8	32	6,23	6,00	6,65	0,155	2,5
M9	32	14,47	13,45	15,35	0,409	2,8
M10	32	3,01	2,75	3,30	0,149	4,9
M11	32	4,73	4,20	5,20	0,250	5,3
M12	31	6,47	6,15	6,90	0,168	2,6
M13	32	1,64	1,50	1,75	0,062	3,8
M14	32	3,00	2,45	3,35	0,187	6,3
M15	32	2,79	2,45	3,00	0,131	4,7
M16	32	11,55	10,50	12,45	0,453	3,9
M17	31	4,26	3,95	4,50	0,166	3,9
M18	32	1,42	1,05	1,85	0,216	15,3
M19	31	5,32	4,95	5,70	0,175	3,3
M20	32	12,65	12,00	13,25	0,347	2,7
M21	32	1,35	1,15	1,50	0,080	5,9
M22	32	6,34	5,85	7,20	0,327	5,2
M23	32	4,68	4,30	5,00	0,174	3,7
M24	31	8,36	7,10	9,60	0,443	5,3
W	18	45,9	36	55	4,99	10,9
TOL	19	184,9	150	200	12,33	6,7
HB	18	118,5	113	126	4,29	3,6
TL	18	68,3	40	80	9,37	13,7
HF	19	22,9	22,0	24,0	0,66	2,9
EL	18	18,2	16,0	19,0	0,92	5,1

Table 5. 1. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. dudui* (OTU 4).

		OTU 4 Kisangani RB				
L.dudui		**M+F**	**age = 2+ 3**			
	N	**Mean**	**Min**	**Max**	**SD**	**CV %**
M1	87	27,95	26,25	29,80	0,76	2,7
M2	108	26,67	24,80	28,40	0,77	2,9
M3	104	22,64	20,55	24,00	0,72	3,2
M4	109	11,38	10,25	12,30	0,41	3,6
M5	109	5,91	5,30	6,75	0,32	5,4
M6	109	7,40	6,70	8,15	0,30	4,1
M7	109	8,79	7,80	9,65	0,36	4,1
M8	109	5,55	5,10	6,00	0,20	3,7
M9	106	13,68	12,45	14,90	0,50	3,6
M10	109	3,12	2,65	3,55	0,17	5,6
M11	109	4,47	4,05	5,00	0,21	4,7
M12	109	6,59	6,05	7,05	0,21	3,3
M13	109	1,65	1,45	1,80	0,07	4,3
M14	109	2,53	2,15	3,00	0,19	7,4
M15	109	2,68	2,40	3,00	0,12	4,5
M16	89	11,05	9,60	12,60	0,50	4,5
M17	108	4,09	3,75	4,55	0,17	4,3
M18	109	1,40	0,90	1,80	0,16	11,4
M19	108	4,82	4,35	5,30	0,18	3,8
M20	108	12,26	11,65	12,90	0,29	2,3
M21	109	1,02	0,85	1,20	0,08	7,8
M22	109	5,89	5,15	6,35	0,24	4,1
M23	109	4,96	4,25	5,50	0,26	5,2
M24	103	7,72	6,95	8,60	0,33	4,2
W						
TOL	63	165,7	125	238	15,96	9,6
HB	92	108,9	89	124	6,68	6,1
TL	52	61,0	51	72	4,37	7,2
HF	85	18,9	17,2	20,9	0,67	3,5
EL	61	13,5	11,0	16,2	1,27	9,4

Table 5. 2. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. zena* (OTU 21+22).

		OTU21+22 Aberdare Range + Mt Kenya				
L.zena		**M+F**	**age = 2+3**			
	N	**Mean**	**Min**	**Max**	**SD**	**CV %**
M1	55	30,11	28,10	32,05	0,960	3,2
M2	55	28,98	26,75	30,80	1,043	3,6
M3	54	24,55	22,75	26,25	0,911	3,7
M4	56	12,63	11,55	13,95	0,532	4,2
M5	56	6,31	5,65	7,10	0,321	5,1
M6	56	7,99	7,20	8,80	0,381	4,8
M7	55	9,53	8,60	10,60	0,470	4,9
M8	56	6,08	5,50	6,45	0,183	3,0
M9	55	14,91	13,45	16,50	0,671	4,5
M10	56	2,99	2,50	3,50	0,220	7,4
M11	55	5,17	4,70	5,50	0,198	3,8
M12	56	6,74	6,05	7,40	0,305	4,5
M13	56	1,74	1,55	1,95	0,085	4,9
M14	56	3,05	2,65	3,50	0,206	6,8
M15	56	2,92	2,50	3,40	0,162	5,5
M16	56	12,68	11,60	13,80	0,575	4,5
M17	56	4,64	4,25	5,15	0,190	4,1
M18	55	1,46	1,10	1,80	0,165	11,3
M19	56	5,54	5,10	5,90	0,202	3,7
M20	56	12,80	12,00	13,40	0,322	2,5
M21	56	1,44	1,20	1,60	0,090	6,3
M22	56	6,44	5,70	7,65	0,452	7,0
M23	56	4,93	4,50	5,35	0,214	4,3
M24	56	8,67	7,70	9,85	0,425	4,9
W	52	51,7	34	70	7,05	13,6
TOL	51	193,9	162	226	12,92	6,7
HB	52	123,4	108	139	8,65	7,0
TL	51	70,7	42	88	9,67	13,7
HF	52	21,5	19,0	23,2	0,83	3,8
EL	51	18,2	16,3	20,5	1,07	5,9

Table 5. 3. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. margarettae* (OTU 20).

		OTU 20 Solai				
L.margarettae		M+F	age = 2+ 3			
	N	Mean	Min	Max	SD	CV%
M1	42	29,91	28,30	31,35	0,709	2,4
M2	44	28,38	26,70	30,00	0,735	2,6
M3	43	24,11	22,55	25,70	0,707	2,9
M4	44	12,19	11,10	12,75	0,368	3,0
M5	44	6,29	5,60	6,90	0,276	4,4
M6	44	7,84	7,15	8,45	0,285	3,6
M7	44	9,25	8,40	10,05	0,352	3,8
M8	44	5,76	5,40	6,50	0,208	3,6
M9	39	14,37	13,15	15,35	0,516	3,6
M10	44	2,98	2,65	3,35	0,159	5,3
M11	44	5,03	4,70	5,40	0,178	3,5
M12	43	6,76	6,40	7,25	0,188	2,8
M13	44	1,78	1,55	2,00	0,106	6,0
M14	44	2,89	2,50	3,35	0,220	7,6
M15	44	2,79	2,60	3,00	0,105	3,8
M16	41	12,40	11,25	13,65	0,501	4,0
M17	44	4,48	3,40	5,00	0,257	5,7
M18	44	1,48	0,90	1,80	0,205	13,9
M19	44	5,37	5,00	5,85	0,209	3,9
M20	42	12,83	12,30	13,45	0,251	2,0
M21	44	1,20	1,00	1,40	0,092	7,7
M22	44	6,28	5,75	6,90	0,262	4,2
M23	44	5,15	4,60	5,60	0,213	4,1
M24	35	8,69	8,15	9,30	0,281	3,2

Table 5. 4. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. rita* (OTU 11).

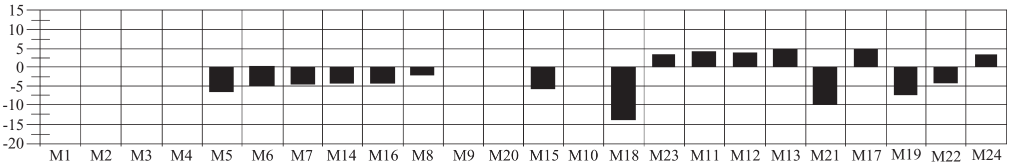
		OTU 11 Congo S.				
L.rita		M+F	age = 2+3			
	N	Mean	Min	Max	SD	CV%
M1	22	29,84	28,75	31,10	0,657	2,2
M2	24	28,39	26,50	29,90	0,815	2,9
M3	24	24,06	22,10	25,50	0,863	3,6
M4	24	12,26	11,50	13,25	0,468	3,8
M5	24	6,08	5,55	6,70	0,279	4,6
M6	24	7,58	6,95	8,25	0,389	5,1
M7	24	9,03	8,25	10,05	0,480	5,3
M8	24	5,81	5,15	6,35	0,258	4,4
M9	20	14,76	13,90	15,60	0,505	3,4
M10	24	2,98	2,70	3,50	0,178	6,0
M11	24	5,18	4,95	5,45	0,105	2,0
M12	24	6,93	6,50	7,20	0,201	2,9
M13	24	1,81	1,65	1,95	0,092	5,1
M14	24	2,83	2,50	3,15	0,177	6,3
M15	24	2,78	2,55	3,20	0,155	5,6
M16	22	12,00	11,30	13,20	0,519	4,3
M17	23	4,71	4,35	5,05	0,182	3,9
M18	21	1,65	0,90	2,00	0,241	14,6
M19	23	5,05	4,75	5,45	0,151	3,0
M20	24	12,70	12,10	13,25	0,308	2,4
M21	24	1,19	1,05	1,35	0,073	6,1
M22	24	6,46	5,90	7,05	0,320	5,0
M23	24	5,03	4,70	5,60	0,236	4,7
M24	15	8,19	7,65	8,90	0,418	5,1

		OTU 38				
L.chrysopus		M+F	age = 2+3			
	N	Mean	Min	Max	SD	CV%
M1	66	29,50	27,80	31,10	0,727	2,5
M2	67	27,79	25,95	29,30	0,697	2,5
M3	67	23,64	22,00	25,05	0,669	2,8
M4	67	11,97	10,85	13,25	0,445	3,7
M5	67	6,08	5,60	6,70	0,276	4,5
M6	67	7,62	6,90	8,25	0,298	3,9
M7	67	8,78	7,90	9,50	0,368	4,2
M8	67	5,94	5,55	6,30	0,181	3,1
M9	67	14,09	12,50	15,00	0,433	3,1
M10	67	2,92	2,65	3,30	0,138	4,7
M11	67	4,84	4,40	5,35	0,170	3,5
M12	67	6,43	6,15	6,70	0,138	2,1
M13	67	1,62	1,45	1,75	0,064	4,0
M14	67	2,98	2,50	3,50	0,198	6,6
M15	67	2,64	2,25	3,00	0,166	6,3
M16	66	11,72	10,75	12,90	0,436	3,7
M17	67	4,32	3,90	4,75	0,163	3,8
M18	64	1,56	1,10	2,00	0,184	11,8
M19	67	5,23	4,80	5,55	0,185	3,5
M20	67	12,46	11,85	13,20	0,327	2,6
M21	67	1,33	1,10	1,50	0,085	6,4
M22	67	5,98	5,50	6,35	0,195	3,3
M23	67	4,66	4,25	5,20	0,209	4,5
M24	66	8,18	7,15	9,00	0,322	3,9
W	47	41,0	32	59	6,70	16,4
TOL	22	194,0	180	212	8,37	4,3
HB	47	113,2	100	130	6,68	5,9
TL	22	78,8	72	87	4,40	5,6
HF	42	21,3	20,0	22,3	0,53	2,5
EL	47	17,5	16,0	19,0	0,64	3,7

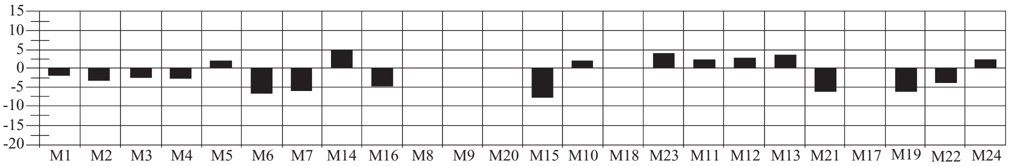
Table 5. 5. Listing of the 24 craniometric measurements and the external body measurements, and the sample sizes for *L. chrysopus* (OTU 38). [left and above]

Table 6. 1. Comparison for all measurements between OTU 50 (*aquilus*) = 100 % versus ...

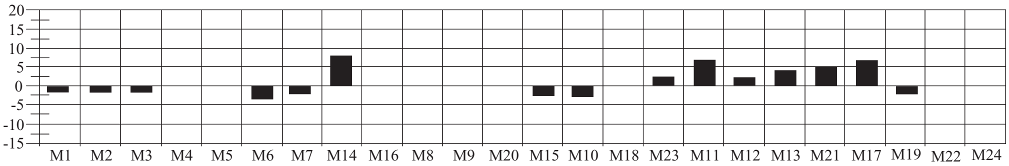
OTU 23
verhageni



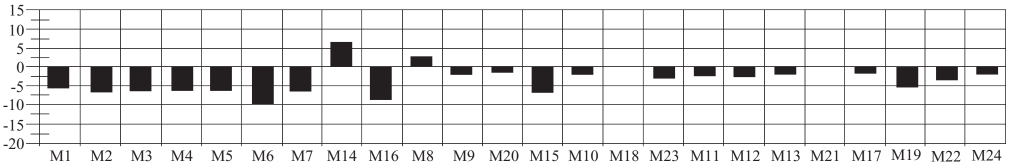
OTU 26
kilonzoi n.sp.



OTU 21 + 22
zena



OTU 14
stanleyi n.sp.



OTU 8
laticeps

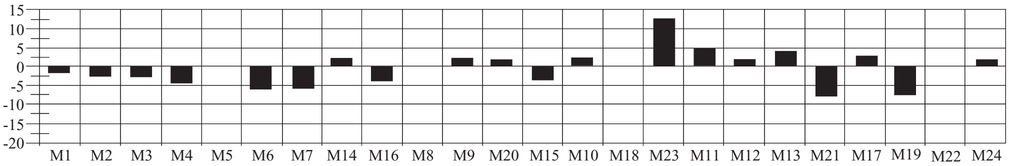
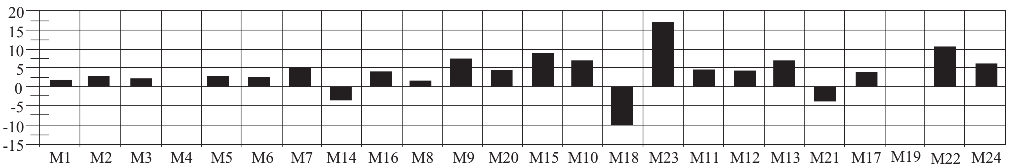


Table 6. 2. Comparison for all measurements between OTU 38 + 39 (*chrysopus* East +West) = 100 % versus ...

OTU 8
laticeps



OTU 50
aquilus

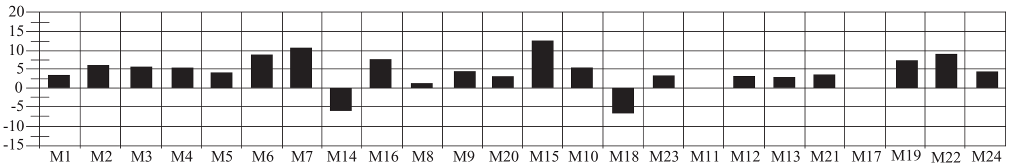
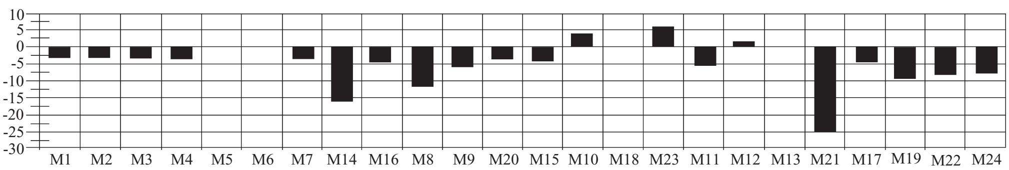


Table 6. 3. Comparison for all measurements between OTU 14 (*stanleyi* n.sp.) = 100 % versus

OTU 4
dudui



OTU 38
chrysopus

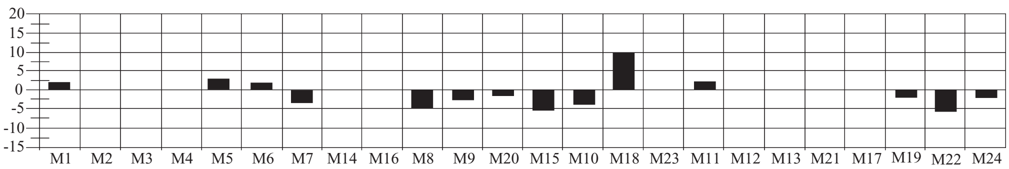
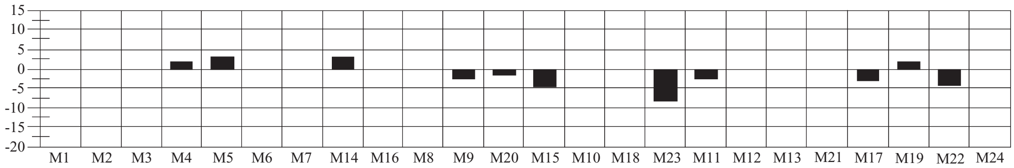
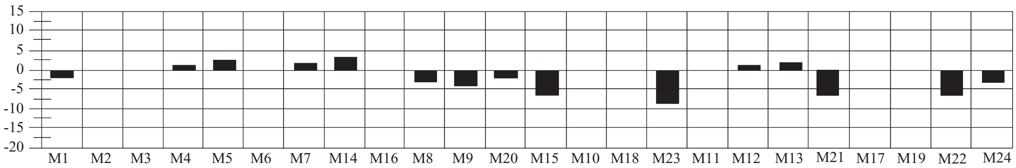


Table 7. Comparison for all measurements between OTU 8 (*laticeps* / Mutura) = 100 % versus ...

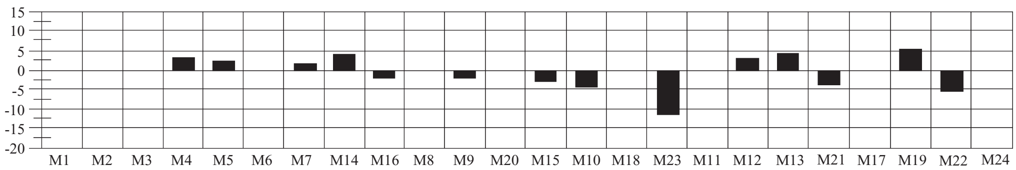
OTU 26
kilonzoi n.sp.



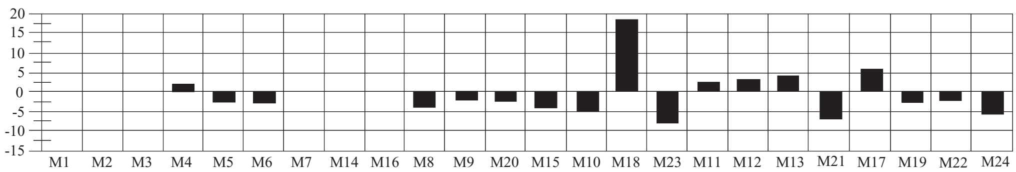
OTU 30
machangui n.sp.



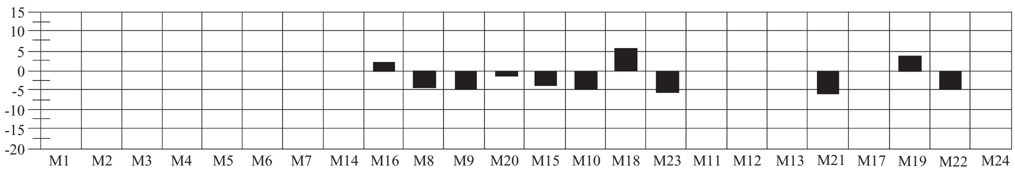
OTU 31
sabunii n.sp.



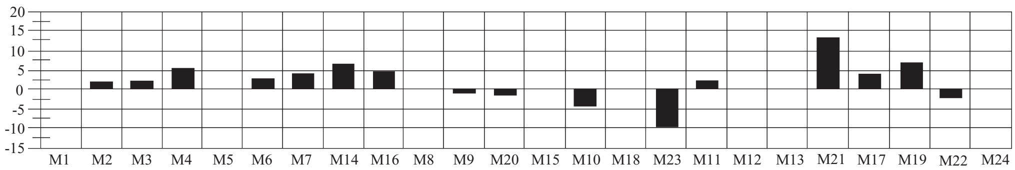
OTU 11
rita



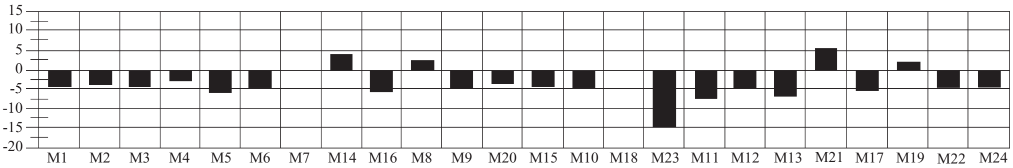
OTU 20
margarettae



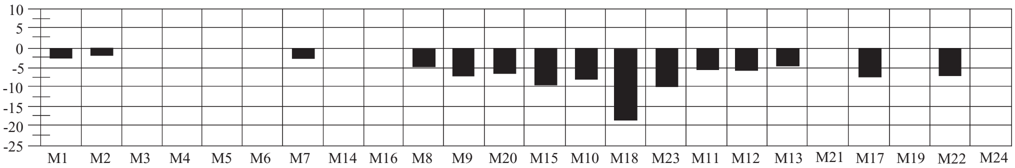
OTU 21 +22
zena



OTU 14
stanleyi n.sp.



OTU 25
makundii n.sp.



OTU 4
dudui

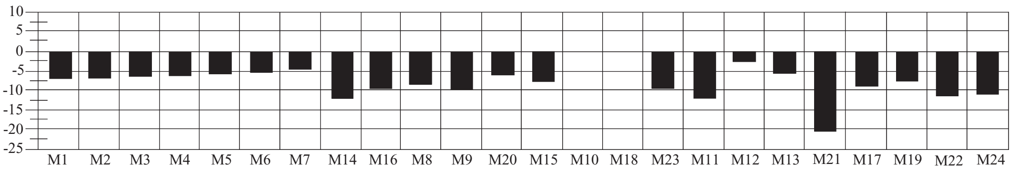


Table 8. Summary of sexual dimorphism in the craniometric measurements (M1-M24) of seventeen OTU's of "speckled" *Lophuromys* of the East African regio. Significances (t-test) are expressed as follows: (m, mm, mmm) males are bigger than females; (f, ff, fff) females are bigger than males. The importance of the significance increases with the number of symbols: one (low significance; 0, 05<p>0, 01); two (high; 0. 01<p>0. 001); three (very high; p<0,001).

OTU	4	5	14	6	8	10	7	8.1	12	20	50	21+2	23	26	27	30	38 + 39
	KISA	IRAN	RUWE	TSHI	MUTU	UWIN	VIRU	KINI	GILO	SOLA	KILI	ABKE	MERU	USAM	ULUG	RUNG	*chryso*
m - w	53-51	17-18	14-18	145-127	47-55	34-15	67-58	29-33	39-42	19-24	37-32	32-21	28-11	29-25	61-74	30-33	32-33
M1													mm	mm			
M2												m	m	mm	m		
M3			w							m		m	m	mm			
M4														mm			
M5														m			
M6														m		m	
M7														mm			
M8			w			m									mm	m	
M9														m			
M10	ww										w						
M11																	
M12																	
M13		(m)			w					m			mm				
M14		(w)															
M15												m					
M16														mm			
M17						w							m				ww
M18				www											w		
M19																m	
M20																	
M21															m		
M22			w									m	mm	mmm	mm	mm	
M23		(m)											mm		m		
M24											m			mmm	mmm		w

Table 9. Summary of the results of a discriminant analyses for all considered OTU's. [continued on next pages]

Function	1	2	3	4	5	6	7	8
OTUx	aquilus	aquilus	aquilus	aquilus	aquilus	aquilus	aquilus	aquilus
OTUy	laticeps	zena	verhageni	kilonzoi	machangui	sabunii	makundii	stanleyi
M1	-0.99	-	-	-	-	-	-	-
M2	1.62	1.10	-	-	-	-	-	-1.58
M3	-	-	-1.96	-	-	-	-	-
M4	-	-	-	-	-	-	-	-
M5	-	-	2.88	2.62	-	2.69	-2.79	-
M6	-	-	-	-3.63	-	-2.99	-	-4.48
M7	-	-	2.44	-	-	-	2.35	3.41
M8	-	-	-	-	-	-	-	2.87
M9	-1.04	-	-	-	-	-	-	-
M10	-	-	-	-	-	-3.44	-	-
M11	-2.51	-5.20	-	-	-	-	-	-
M12	-	-	-4.95	2.44	-	4.30	-	-
M13	-	-	-	-	7.71	-	-	-
M14	-1.89	-4.02	-	3.00	-	3.33	-	4.79
M15	2.75	-	-	-	-	-	4.79	-
M16	-	-	-	-	-	-	-	-
M17	-	-	-	-	-	-	-	-
M18	-	-	-	-	-	-	3.08	-
M19	3.27	-	4.03	-2.63	-4.79	-	-	-
M20	-	-	-	-	-	-	-	-
M21	-	-	-	-6.05	-10.09	-8.73	-	-
M22	-	-	1.80	-	-	-	-	-
M23	-2.73	-	-	3.03	3.42	-	-5.05	-
M24	-	-	-	-	-	-	-	-
Cst	5.30	5.48	7.02	-4.78	8.78	-9.03	1.28	17.82
Ranges								
OTUx	0.0 ; 6.0	-1.0 ; 4.0	-0.5; 4.5	-5.0 ; -0.5	-5.5 ; -0.5	-4.0 ; 1.0	-2.0 ; 3.0	-5.0 ; 1.0
OTUy	-6.0 ; 0.0	3.5; 1.0	-1.0 ; -8.0	0.5 ; 6.5	0.5 ; 5.5	1.0 ; 6.5	-6.0 : -2.0	0.0 ; 7.0
%CC.	98.1	92.7	100	99.2	99.2	100	100	97.9

Table 9 [cont.]. Summary of the results of a discriminant analyses for all considered OTU's. [continued on next page]

Function	9	10	11	12	13	14	15	16	17
OTUx	laticeps	laticeps	laticeps	laticeps	laticeps	laticeps	laticeps	laticeps	laticeps
OTUy	dudui	zena	verhageni	kilonzoi	machangui	sabunii	makundii	stanleyi	margarettae
M1	-	-1.10	-	-	-	-	-	-0.98	-
M2	-	-	1.28	-	-	-	0.80	-	-
M3	-	-	-	-	-	-	-	-	-
M4	-	1.64	-	-1.52	-	-	-	-	-
M5	-	-	-2.26	-2.55	-1.84	1.79	-	1.40	-
M6	-	-	-	-	-	-	-	-	-
M7	-0.96	-	-	1.73	-	-	-	-	-
M8	-	-	-	-	-	-	-	-3.71	-
M9	1.14	-	-1.76	1.07	-	-	-1.57	-	1.99
M10	-	-	-	-	-	-3.58	-	-	2.59
M11	2.71	-	-	3.39	-	-2.26	-2.73	-	2.30
M12	-3.58	-	3.04	-4.57	-4.39	5.29	-	-	-4.91
M13	-	-	-	-	-	-	-	5.43	-
M14	-	-	-2.41	-	-	-	-	-2.90	-
M15	-	-	-	-	3.50	-	-	-	-
M16	-	-	-	-	-	-	-	-	-1.12
M17	-	-	-	-	-	-	-	-	-
M18	-	-	-1.96	-	-	-	-2.41	-	-
M19	-	3.11	-	-	-	2.34	-	-	-2.09
M20	-	-	-	-	-	-	-1.87	-	-
M21	5.98	6.06	-	-	5.96	-	-	-5.38	-
M22	-	-	-	1.75	1.99	-1.87	-	-	1.83
M23	1.40	-2.19	-2.02	1.97	2.12	-2.14	-	2.29	-
M24	0.87	-	-	-	-	-	-	-	-
Cst	-18.46	-0.13	3.37	-5.50	-0.23	-13.14	41.71	-21.50	-3.66
Ranges									
OTUx	-0.5 ; 5.0	-4.0 ; 1.0	-3.5; 2.0	-2.0 ; 3.5	-3.0 ; 3.5	-3.5 ; 2.0	-3.0 ; 3.0	-2.0 ; 4.0	-2.5; 3.5
OTUy	-5.0 ; -0.5	1.0 ; 5.0	1.0 ; 8.0	-5.0 ; 0.5	-4.5 ; 0.0	2.0 ; 5.5	1.0 ; 5.5	-6.0 ; -1.0	-4.5; 0.0
%CC.	100	99.5	97.8	94.2	94.6	100	98.3	98.5	94

Table 9 [cont.]. Summary of the results of a discriminant analyses for all considered OTU’s.

Function	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
OTUx	**zena**	**zena**	**zena**	**verhageni**	**machangui**	**machangui**	**machangui**	**sabunii**	**stanleyi**
OTUy	**margarettae**	**stanleyi**	**kilonzoi**	**kilonzoi**	**kilonzoi**	**sabunii**	**makundii**	**makundii**	**dudui**
M1	–	–	1.47	–	–	–	–	–	–
M2	–	–	–	-1.29	–	–	–	–	1.00
M3	–	–	–	–	-1.39	–	-1.38	–	–
M4	–	–	–	–	–	–	–	–	–
M5	–	–	–	4.20	–	–	–	–	–
M6	–	2.70	-4.02	–	–	–	–	–	–
M7	–	–	–	–	3.03	–	–	-2.54	–
M8	-3.13	-3.20	–	4.19	-3.53	–	-3.18	–	-3.21
M9	–	-1.04	–	–	–	–	–	–	–
M10	–	–	3.77	–	–	–	–	–	–
M11	–	5.17	-4.62	–	4.20	–	4.19	–	–
M12	–	–	–	–	–	–	4.73	-4.33	–
M13	–	–	–	–	–	–	–	-12.98	–
M14	–	–	–	–	–	–	–	–	-2.29
M15	–	–	-3.57	–	–	–	–	–	–
M16	–	–	–	–	–	–	–	–	–
M17	–	–	–	-3.75	–	–	–	–	–
M18	–	–	–	–	–	–	–	–	–
M19	–	–	–	–	–	-7.08	–	–	-2.30
M20	–	–	–	–	1.85	–	2.93	–	–
M21	-10.53	–	-9.50	–	-9.66	–	-13.48	–	-9.91
M22	–	–	–	–	–	–	–	–	–
M23	5.17	–	2.37	–	–	3.54	–	7.15	1.67
M24	–	–	–	–	–	–	–	–	–
Cst	7.11	-11.99	10.76	2.33	-6.00	19.60	-21.83	40.44	11.81
Ranges									
OTUx	-4.5 ; 0.5	-2.0 ; 4.0	-5.0 ; 0.0	-5.0 ; -0.5	-2.0 ; 4.5	-1.0 ; 3.0	-2.0 ; 4.5	-4.5 ; - .0.5	-7.0 ; -3.5
OTUy	1.0 ; 6.5	-4.5 ; 0.0	0.5 ; 4.5	-1.0 ; 4.5	-5.0 ; 1.0	-5.0 ; 1.0	-6.5 ; -1.5	1.0 ; 6.0	-0.5 ; 5.0
			(-1.0)						
%CC.	100	94.2	99	100	92.9	91.4	98.8	100	100

Table 10. Listing of the craniometric data of the type and paratypes of *Lophuromys stanleyi* n.sp.

OTU 14 Bujuku

NUMB	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
Type																
144812	29.45	28.45	24.40	12.00	5.85	8.00	9.70	6.20	14.70	3.05	4.50	6.60	1.65	3.00	2.70	11.40
Paratypes																
144713	26.90	25.00	21.10	10.60	5.60	6.50	7.75	6.00	13.45	2.85	4.70	6.15	1.55	2.45	2.65	10.50
144714	29.00	27.50	23.55	11.95	5.90	7.50	8.95	6.30	14.00	2.95	4.80	6.50	1.65	2.90	2.65	11.95
144715	27.30	26.25	21.70	10.70	5.85	6.75	8.35	6.10	13.35	2.95	4.60	6.40	1.65	2.75	2.80	10.85
144716	29.55	28.10	23.25	12.20	5.85	7.55	9.30	6.45	14.25	3.05	4.95	6.60	1.75	3.25	2.75	12.00
144718	28.45	27.55	23.25	11.75	5.80	7.10	8.50	6.40	13.75	2.85	4.90	6.45	1.75	2.90	2.75	10.75
144719	28.65	27.60	23.25	11.45	5.95	7.30	9.00	6.15	14.45	2.75	4.65		1.70	3.20	2.95	11.85
144720	29.65	27.70	22.70	11.55	6.05	7.20	8.65	6.00	14.05	2.80	4.95	6.30	1.70	3.05	2.85	11.50
144730	28.55	27.85	23.55	11.70	5.60	7.45	9.20	6.00	14.65	3.25	4.65	6.60	1.65	3.00	2.65	11.30
144741	29.55	28.20	23.75	11.70	6.10	7.45	9.00	6.45	15.00	3.00	5.00	6.55	1.70	3.15	2.95	11.50
144750	29.20	27.75	23.60	11.70	5.50	7.30	8.85	6.05	14.70	3.00	4.75	6.30	1.60	3.00	2.80	11.45
144753	28.70	27.00	23.10	11.60	5.65	7.30	8.80	6.15	14.50	3.00	4.70	6.65	1.75	3.20	2.70	11.10
144754	29.90	27.90	23.50	11.80	5.60	7.50	9.30	6.40	14.80	2.95	4.80	6.70	1.70	3.20	2.95	11.60
144755	29.15	27.55	23.60	11.80	5.95	7.55	9.05	6.25	14.50	3.15	4.80	6.60	1.65	3.00	2.90	12.15
144761	27.40	26.25	22.40	11.30	6.00	7.30	8.95	5.80	13.80	3.00	4.50	6.15	1.50	2.95	2.70	11.05
144774		27.55	23.40	12.45	5.70	7.65	9.50	6.50	14.15	3.00	4.65	6.35	1.60	3.05	2.85	12.35
144778	28.60	27.00	23.00	11.80	6.20	7.50	9.15	5.95	14.40	3.00	4.60	6.30	1.55	3.05	2.75	11.20
144779	28.25	27.50	23.45	12.05	5.65	7.65	9.45	6.10	14.85	2.90	4.75	6.30	1.60	2.85	2.85	11.90
144783	28.45	27.00	23.10	12.00	5.45	7.15	9.00	6.15	14.15	2.85	4.80	6.20	1.65	2.65	2.60	10.90
144786	28.55	27.50	23.30	12.30	5.90	7.60	9.35	6.25	14.25	2.80	5.05	6.20	1.60	2.85	2.65	11.65
144789	28.80	27.80	23.45	11.95	6.05	7.45	9.35	6.25	14.95	3.05	4.75	6.50	1.65	2.75	2.75	11.50
144794	29.15	28.10	24.25	12.05	5.95	8.10	9.50	6.15	14.60	3.15	4.20	6.40	1.55	2.90	2.80	11.50
144799	28.95	27.00	23.00	11.70	5.60	7.75	9.35	6.25	13.95	3.05	4.25	6.25	1.55	2.95	2.80	11.25
144805	28.30	26.80	22.60	11.40	5.70	7.45	9.15	6.15	14.05	3.00	4.25	6.35	1.55	2.90	2.85	11.00
144820	29.50	28.25	24.25	12.20	5.90	8.05	9.75	6.00	14.30	3.30	4.25	6.50	1.60	3.20	2.70	11.75

NUMB	M17	M18	M19	M20	M21	M22	M23	M24	W	TOL	HB	TL	HF	EL
Type														
144812	4.05	1.10	5.25	13.15	1.45	6.35	4.30	8.95	52	198.5	123.5	75	24.0	18
Paratypes														
144713	4.25	1.75	5.25	12.35	1.15	5.85	4.45	7.10	36	177	113	64	22.0	18
144714	4.25	1.50	5.50	12.45	1.45	6.25	4.80	8.05	45	166	126	40	23.0	19
144715	4.25	1.30	5.10	12.30	1.30	5.65	4.70	7.50	37	177	112	65	22.0	18
144716	4.70	1.55	5.40	12.50	1.45	6.30	4.65	8.40	43	192	121	71	22.0	19
144718	4.50	1.45	5.20	12.40	1.45	6.30	4.65	8.65	48	191	119	72	23.0	19
144719	4.15	1.50	5.20	12.00	1.40	6.20	4.80	8.40	50	180	122	58	22.0	18
144720	4.30	1.75	5.35	12.65	1.25	5.95	4.30	7.75	49	155	114	41	23.0	18
144730	4.20	1.65	5.30	12.65	1.45	6.10	4.75	8.40	37	185	104	81	24.0	19
144741	4.50	1.85	5.50	13.25	1.45	6.35	4.95	8.60	45	194	124	70	24.0	16
144750	4.45	1.40	5.40	12.35	1.35	6.20	4.60	8.90	47	171	116	55	24.0	
144753	4.35	1.75	5.25	13.00	1.25	6.05	4.85	8.20	45	195	121	74	23.0	19
144754	4.45	1.40	5.55	13.00	1.30	6.75	4.80	8.40	50	200	120	80	22.0	17
144755	4.35	1.50	5.50	12.50	1.45	6.50	4.90	8.05	37	189	116	73	23.0	18
144761	4.00	1.40	5.30	12.25	1.25	6.00	4.50	8.35	36	182	111	71	22.0	18
144774	3.95	1.05	5.15	12.30	1.35	6.00	4.70	8.05	49	194	120	74	22.0	19
144778	4.05	1.35	5.30	12.90	1.45	6.00	4.25	7.80	43	187	120	67	22.0	19
144779	4.05	1.15	5.20	12.85	1.30	7.20	4.65	8.15		189	113	76	22.0	17
144783	4.00	1.15	5.40	12.80	1.40	5.90	4.40	7.65	42	178	113	65	23.0	17
144786	4.30	1.10	5.00	12.65	1.35	6.30	4.50	7.95	51	187	118	69	23.0	18
144789	4.20	1.30	5.15	13.00	1.30	5.95	4.70	8.10	44	193	124	69	23.0	18
144794		1.25	5.15	12.35	1.35	6.95	4.55	9.60	55	188	117	71	23.0	19
144799	3.95	1.10	5.25	12.35	1.30	6.25	4.65	8.20	42	185	113	72	23.0	19
144805	4.00	1.35	5.40	12.50	1.45	6.05	4.60	8.25	43	187	115	72	23.0	19
144820	4.15	1.25	5.35	12.70	1.45	6.10	4.60	8.50	49	150			23.0	19

Table 11. Listing of the craniometric data of the type and paratypes of *Lophuromys kilonzoi* n.sp. [continued on next page]

OTU 26 Magamba

NUMB	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
Type																
96.037.M-2348	29.35	27.95	23.85	12.10	6.25	7.50	8.95	6.15	14.35	2.90	4.90	6.60	1.75	3.10	2.80	11.50
Paratypes																
96.037.M-2334	30.30	28.45	24.15	12.15	6.50	7.70	8.95	6.10	14.45	3.10	4.70	6.60	1.65	3.15	2.65	12.05
96.037.M-2335	—	28.75	24.25	12.10	6.40	7.70	9.15	6.15	14.90	2.90	4.85	6.45	1.65	3.00	2.55	—
96.037.M-2336	30.35	29.00	24.65	12.65	6.45	7.65	9.05	6.25	14.70	3.00	5.25	6.90	1.90	3.10	2.70	12.55
96.037.M-2337	—	29.30	24.75	12.45	6.80	7.80	8.95	6.30	15.00	3.10	5.00	6.60	1.75	3.10	2.90	—
96.037.M-2340	30.50	29.30	24.70	12.35	6.65	7.85	9.25	6.20	15.05	3.05	4.95	6.90	1.90	3.05	2.60	11.90
96.037.M-2344	30.15	28.75	24.50	12.45	6.75	7.75	9.00	5.90	14.55	2.85	5.20	6.65	1.80	3.10	2.60	12.50
96.037.M-2345	29.50	27.85	23.55	12.00	6.35	7.55	9.05	5.95	14.20	3.25	4.75	6.45	1.55	3.15	2.60	12.10
96.037.M-2346	29.45	27.85	23.65	12.05	6.50	7.45	8.65	6.00	14.60	2.95	4.90	6.50	1.70	2.85	2.60	11.55
96.037.M-2349	29.25	28.00	23.90	11.95	6.65	7.80	9.00	5.85	—	3.10	4.75	6.85	1.75	3.00	2.75	11.60
96.037.M-2350	29.10	27.30	23.15	12.10	6.70	7.45	8.85	5.80	13.70	3.00	4.85	6.45	1.65	2.75	2.70	11.75
96.037.M-2354	28.40	27.05	22.80	11.65	6.45	7.15	8.50	5.90	13.80	2.70	4.90	6.55	1.75	2.70	2.55	11.45
96.037.M-2356	29.30	27.95	23.50	11.95	6.25	7.35	8.75	5.80	14.40	2.85	5.15	6.65	1.85	3.05	2.75	12.00
96.037.M-2357	—	28.30	24.00	12.45	6.50	7.70	8.65	6.50	15.05	3.30	4.80	6.80	1.60	2.85	2.75	—
96.037.M-2359	30.05	28.40	24.25	12.00	6.15	7.55	8.85	6.00	14.65	3.15	5.05	6.75	1.75	3.15	2.65	12.30
96.037.M-2360	29.40	27.75	23.40	11.85	6.15	7.10	8.55	5.95	14.05	3.10	5.15	6.80	1.80	2.65	2.80	11.05
96.037.M-2361	29.25	28.00	23.60	12.10	6.20	7.45	8.90	5.95	14.25	2.75	5.10	6.55	1.75	2.75	2.75	12.10
96.037.M-2362	30.55	29.15	24.55	12.65	6.65	8.05	9.60	6.30	15.40	3.50	5.00	7.25	1.85	3.00	2.75	11.90
96.037.M-2363	—	28.05	—	12.25	6.35	7.75	8.95	6.10	14.30	3.15	4.90	6.65	1.75	2.85	2.55	—
96.037.M-2365	30.00	28.95	24.75	12.05	6.50	7.50	8.85	5.85	14.90	3.30	5.20	7.15	1.85	2.85	2.75	12.00
96.037.M-2372	29.25	27.95	23.60	11.75	6.25	7.40	8.70	6.05	14.00	3.15	5.15	6.80	1.75	2.55	2.80	11.60
96.037.M-2373	30.80	29.60	25.20	12.95	6.85	7.80	9.75	6.25	14.70	3.10	5.10	6.70	1.75	3.15	2.80	12.35
96.037.M-2379	29.15	27.40	—	11.80	5.95	7.40	8.45	6.10	14.35	3.20	4.95	7.00	1.85	2.85	2.75	10.85

Table 11. [cont.] Listing of the craniometric data of the type and paratypes of *Lophuromys kilonzoi* n.sp.

NUMB	M17	M18	M19	M20	M21	M22	M23	M24	W	TOL	HB	TL	HF	EL
Type														
96.037.M-2348	4.40	1.30	5.10	12.70	1.20	6.30	4.70	8.40	51	192	120	72	21.3	17.9
Paratypes														
96.037.M-2334	4.15	1.30	4.90	12.60	1.35	6.25	4.90	8.80	54	195	121	74	20.7	18.9
96.037.M-2335	4.15	1.35	5.35	12.60	1.25	6.65	5.05	8.70	61	-	121	-	21.5	19.4
96.037.M-2336	4.55	1.40	5.20	12.65	1.25	6.25	4.80	8.60	54	205	129	76	22.9	19.5
96.037.M-2337	4.30	1.50	5.60	13.40	1.45	6.65	4.95	8.80	54	198	125	73	21.3	18.1
96.037.M-2340	4.15	1.50	5.30	13.20	1.45	6.35	5.10	8.55	53	215	131	84	22.6	19.5
96.037.M-2344	4.40	1.30	5.40	12.45	1.20	6.05	4.90	8.80	60	198	120	78	21.2	17.7
96.037.M-2345	4.35	1.35	4.95	12.30	1.30	6.25	4.80	8.35	52	192	120	72	21.4	19.5
96.037.M-2346	4.25	1.25	4.90	12.50	1.30	6.10	5.00	8.35	50	194	124	70	20.4	19.6
96.037.M-2349	4.30	1.15	5.25	12.70	1.25	6.25	4.90	8.50	52	190	128	62	21.6	20.0
96.037.M-2350	4.25	1.35	5.15	12.55	1.20	5.85	4.50	8.25	51	207	146	61	20.3	18.0
96.037.M-2354	4.50	1.25	5.00	12.60	1.25	5.80	4.55	8.20	34	181	100	81	21.0	19.5
96.037.M-2356	4.35	1.25	5.05	12.65	1.25	6.25	4.90	8.70	52	196	120	76	21.7	19.9
96.037.M-2357	4.35	1.35	5.00	12.90	1.20	6.15	4.75	8.45	55	196	128	68	21.6	19.8
96.037.M-2359	4.35	1.25	5.25	12.65	1.25	6.15	4.80	8.65	61	210	127	83	20.6	19.9
96.037.M-2360	4.50	1.70	5.45	12.60	1.35	6.05	5.05	8.50	53	200	127	73	21.4	19.4
96.037.M-2361	4.20	1.05	5.30	12.80	1.35	6.20	4.75	8.50	51	194	126	68	21.3	17.5
96.037.M-2362	4.45	1.60	5.50	13.25	1.30	6.50	5.15	8.90	63	205	131	74	23.0	19.0
96.037.M-2363	4.25	1.70	5.10	13.00	1.15	6.30	5.10	8.80	68	200	132	68	21.6	17.2
96.037.M-2365	4.30	1.45	5.40	12.25	1.35	6.20	5.25	8.75	61	-	126	-	22.4	15.7
96.037.M-2372	4.20	1.45	5.10	12.65	1.20	6.05	5.15	8.35	50	215	126	89	21.8	19.5
96.037.M-2373	4.35	1.50	5.60	12.75	1.25	6.50	4.85	9.15	62	204	136	68	23.0	20.5
96.037.M-2379	4.25	1.50	5.50	13.05	1.35	5.95	5.05	8.30	64	175	125	50	22.3	16.7

Table 12. Listing of the craniometric data of the type and paratypes of *Lophuromys machangui* n.sp. [continued on next page]

OTU 30 Mt Rungwe

NUMB	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
Type																
96.037.M-2263	29.25	28.20	24.00	12.15	6.55	7.75	9.05	6.00	14.15	3.15	5.20	6.80	1.80	2.60	2.80	12.20
Paratypes																
96.037.M-2207	29.90	28.30	23.65	12.35	6.45	7.75	9.35	5.75	14.60	2.80	5.25	6.85	1.80	2.90	2.70	12.20
96.037.M-2215	—	27.80	23.45	11.70	6.45	7.85	9.35	5.55	14.55	3.30	4.85	6.80	1.70	3.10	2.80	—
6169 - SUA *	29.75	28.10	23.60	12.00	6.50	7.60	9.20	6.00	14.90	3.15	5.00	6.85	1.70	3.10	2.85	11.70
96.037.M-2216	30.25	28.20	23.80	11.85	6.40	7.85	9.20	5.90	14.15	3.00	5.20	6.85	1.90	3.10	2.90	12.30
96.037.M-2217	29.30	27.60	22.85	11.45	6.10	7.50	9.05	5.85	14.10	2.85	4.80	6.70	1.85	2.95	2.50	12.00
96.037.M-2226	30.40	29.10	25.00	12.50	5.90	8.00	9.60	6.10	15.10	3.10	5.10	7.10	1.80	3.35	2.75	12.90
96.037.M-2228	—	27.90	23.55	12.10	6.35	7.75	9.50	5.55	14.40	3.00	5.15	6.60	1.70	2.85	2.75	12.10
96.037.M-2231	29.15	28.35	23.85	11.75	6.40	7.85	9.55	5.70	14.25	3.15	4.80	6.60	1.70	2.75	2.70	12.20
96.037.M-2232	29.40	27.85	23.75	12.15	6.10	7.65	9.10	6.05	14.40	3.20	5.00	6.80	1.75	2.85	2.80	12.05
96.037.M-2233	31.25	30.15	25.50	12.65	6.80	8.20	9.55	6.10	15.60	3.20	5.10	7.25	1.85	3.10	2.80	13.40
96.037.M-2234	30.65	28.95	24.60	12.50	6.50	7.80	9.25	6.10	15.05	2.75	5.15	6.60	1.80	3.15	2.70	12.95
96.037.M-2235	28.80	27.90	23.75	11.60	6.30	7.70	9.25	5.70	14.10	2.95	4.75	6.70	1.75	2.80	2.70	11.70
96.037.M-2236	30.10	28.90	24.65	12.50	6.95	8.15	9.60	6.10	15.00	3.10	4.90	6.90	1.70	2.95	2.90	12.65
96.037.M-2237	29.45	28.25	23.95	12.05	6.40	8.00	9.55	6.00	14.50	3.25	4.90	6.85	1.75	2.80	2.60	11.95
96.037.M-2238	30.10	29.35	25.05	12.45	6.40	8.20	9.75	6.15	15.05	3.35	5.00	7.10	1.75	2.95	2.85	12.20
96.037.M-2246	30.25	28.75	24.50	11.70	6.40	7.70	9.35	6.05	15.20	3.35	5.00	7.25	1.90	3.00	2.65	11.75
96.037.M-2247	—	28.75	24.25	11.75	6.20	7.65	9.25	5.95	14.85	3.05	5.20	7.05	1.85	3.10	2.80	—
96.037.M-2248	28.75	27.75	23.40	12.00	6.05	8.05	9.50	6.00	14.55	3.45	4.90	7.15	1.70	2.85	2.80	12.50
6356 - SUA*	28.75	27.60	23.25	11.75	6.10	7.55	8.95	5.60	14.15	2.85	4.70	6.55	1.65	2.85	2.45	11.45
96.037.M-2257	29.45	28.35	24.00	12.35	6.35	8.10	9.45	5.80	13.50	3.15	4.90	6.55	1.70	2.95	2.70	11.60
96.037.M-2258	29.40	27.75	23.55	11.95	6.00	7.75	9.15	5.70	14.20	2.85	5.00	6.65	1.75	3.00	2.70	12.10
96.037.M-2261	28.45	27.25	—	12.05	6.45	7.60	8.95	6.05	14.05	3.10	4.65	6.65	1.70	2.75	2.75	11.60
96.037.M-2262	29.45	28.05	23.65	12.50	6.30	8.05	9.50	6.00	14.30	3.20	4.95	6.85	1.75	2.90	2.90	12.20
96.037.M-2264	—	27.65	23.30	12.05	6.50	7.90	9.25	6.00	14.45	2.95	5.05	6.75	1.75	2.55	2.70	—
96.037.M-2265	28.80	27.95	23.50	11.70	6.30	7.80	9.30	6.00	14.60	3.15	4.90	7.05	1.80	3.10	2.80	11.45
96.037.M-2267	—	29.05	24.45	12.40	6.70	8.00	9.55	5.75	15.25	3.20	5.35	7.15	1.85	2.75	2.70	12.50
96.037.M-2268	29.10	28.30	23.55	12.20	6.35	7.55	8.95	5.70	13.85	2.75	5.45	6.60	1.80	2.90	2.60	12.00
96.037.M-2270	28.90	28.00	23.50	11.50	6.25	7.55	9.00	6.00	14.35	3.20	4.85	6.85	1.70	2.75	2.60	11.60
96.037.M-2271	28.70	27.30	22.90	11.90	6.00	7.70	9.05	5.95	14.60	3.20	4.65	6.90	1.75	2.80	2.80	11.70
96.037.M-2272	28.10	27.10	22.70	11.75	6.45	7.55	9.00	5.70	13.95	2.85	4.90	6.60	1.80	2.95	2.90	12.00
96.037.M-2273	29.10	27.70	23.30	11.75	6.05	7.40	9.10	5.95	14.35	3.20	5.00	6.95	1.80	2.75	2.70	12.00
96.037.M-2274	29.15	27.60	23.35	12.00	5.95	7.65	9.05	5.70	13.95	3.15	4.75	6.70	1.70	2.80	2.75	12.15

* SUA (Sokoine University of Agriculture) Rodent Pest Centre

Table 12. [cont.] Listing of the craniometric data of the type and paratypes of *Lophuromys machangui* n.sp.

NUMB	M17	M18	M19	M20	M21	M22	M23	M24	W	TOL	HB	TL	HF	EL
Type														
96.037.M-2263	4.35	1.50	5.25	12.90	1.20	6.10	5.10	8.20	48	177	115	62	21.8	16.2
Paratypes														
96.037.M-2207	4.45	1.40	5.00	13.00	1.30	6.15	4.75	8.45	40	173	125	48	21.4	16.9
96.037.M-2215	4.15	1.65	4.90	12.80	1.05	5.85	5.00	8.40	51	195	123	72	—	—
6169- SUA*	4.55	1.30	5.15	12.80	1.15	6.30	5.00	8.80	54	167	121	46	21.7	16.4
96.037.M-2216	4.50	1.20	5.30	12.45	1.10	6.15	4.80	8.00	46	201	125	76	22.0	15.0
96.037.M-2217	4.45	1.25	5.15	13.00	1.20	6.05	4.70	8.40	48	191	118	73	21.3	17.7
96.037.M-2226	4.60	1.45	5.00	13.05	1.20	6.60	5.15	8.30	50	206	130	76	21.6	16.4
96.037.M-2228	4.65	1.20	5.10	12.70	1.20	5.95	5.10	8.40	49	186	122	64	21.2	17.4
96.037.M-2231	4.30	1.25	5.10	12.45	1.15	5.80	4.90	8.45	54	193	121	72	20.6	15.8
96.037.M-2232	4.35	1.60	5.15	12.90	1.10	6.05	5.00	8.45	58	—	122	—	21.6	15.5
96.037.M-2233	4.30	1.30	5.55	13.15	1.35	6.90	5.60	8.95	52	190	132	58	22.1	16.9
96.037.M-2234	4.45	1.20	5.10	13.15	1.15	6.10	4.95	8.60	45	183	127	56	22.0	15.8
96.037.M-2235	4.30	1.25	5.05	13.10	1.15	5.90	4.75	7.85	46	—	121	—	19.6	16.6
96.037.M-2236	4.40	1.40	5.10	13.00	1.25	6.35	5.35	8.75	46	—	122	—	20.6	17.7
96.037.M-2237	4.15	1.30	5.25	12.65	1.25	6.15	5.10	8.15	58	201	127	74	20.4	17.7
96.037.M-2238	4.80	1.35	5.30	13.05	1.15	6.45	5.15	8.05	60	192	134	58	22.7	—
96.037.M-2246	4.55	1.55	5.20	12.85	1.15	6.10	5.30	8.85	41	174	112	62	20.7	16.3
96.037.M-2247	4.30	1.55	5.35	12.75	1.35	6.20	5.00	8.25	52	194	123	71	17.6	16.6
96.037.M-2248	4.35	1.50	5.15	12.70	1.20	6.00	5.00	8.00	38	185	115	70	20.3	17.2
6356 - SUA *	4.15	1.40	4.95	12.60	1.10	5.85	4.65	8.20	38	178	112	66	19.3	—
96.037.M-2257	4.35	1.50	5.00	12.55	1.15	5.80	4.75	8.30	38	173	105	68	20.4	17.1
96.037.M-2258	4.40	1.35	5.05	12.40	1.15	5.90	5.05	8.00	52	186	117	69	20.0	16.2
96.037.M-2261	4.30	1.45	4.95	12.75	1.25	6.05	4.95	7.80	44	189	117	72	20.8	16.8
96.037.M-2262	4.20	1.35	5.20	12.65	1.20	6.20	4.95	8.40	48	186	120	66	21.6	16.7
96.037.M-2264	4.50	1.35	5.00	12.85	1.15	5.95	5.00	8.00	46	179	122	57	20.5	16.7
96.037.M-2265	4.10	1.50	5.20	12.80	1.20	6.65	5.20	8.45	50	168	116	52	20.1	16.8
96.037.M-2267	4.25	1.40	5.30	12.75	1.20	6.50	5.05	—	54	196	128	68	—	—
96.037.M-2268	4.40	1.45	5.10	12.50	1.35	6.10	4.85	8.00	49	187	119	68	21.2	16.7
96.037.M-2270	4.15	1.25	5.20	12.50	1.20	6.05	4.90	7.85	40	187	119	68	20.5	17.0
96.037.M-2271	4.35	1.30	5.20	12.80	1.20	6.35	5.10	8.20	41	181	118	63	19.3	15.8
96.037.M-2272	4.40	1.60	4.85	12.40	1.15	6.00	4.75	7.95	44	181	112	69	19.1	17.0
96.037.M-2273	4.55	1.55	5.20	13.00	1.10	6.15	4.80	8.35	50	193	125	68	21.5	16.3
96.037.M-2274	4.35	1.60	5.20	12.55	1.15	6.25	4.90	8.15	46	188	116	72	20.5	13.4

Table 13. Listing of the craniometric data of the type and paratypes of *Lophuromys sabunii* n.sp. [continued on next page]

OTU 31 Mbizi

NUMB	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
Type																
96.037.M-3796	29.60	28.05	23.85	12.00	6.20	7.85	9.35	5.60	14.20	3.25	4.65	6.85	1.70	3.10	2.75	12.20
Paratypes																
96.037.M-3789	30.15	28.95	—	12.70	6.70	8.10	9.45	5.95	15.30	3.05	4.85	7.00	1.90	2.85	3.00	11.90
96.037.M-3790	30.30	—	—	12.40	6.10	7.40	9.00	6.40	16.00	3.10	5.35	7.30	1.90	3.20	2.95	11.60
96.037.M-3791	29.45	28.45	24.20	12.00	6.05	7.60	9.00	6.15	14.75	3.10	5.00	6.80	1.80	3.00	2.85	11.80
96.037.M-3793	30.70	29.50	25.20	12.50	6.35	7.75	9.10	6.10	14.30	2.90	5.15	7.00	1.95	3.10	2.70	11.70
96.037.M-3794	30.65	29.00	24.65	12.60	6.70	8.20	9.85	5.75	14.75	3.10	5.00	6.95	1.80	3.15	3.00	12.90
96.037.M-3795	31.15	30.10	25.80	13.00	6.75	8.25	9.80	6.15	15.85	3.20	4.85	7.15	1.90	3.15	2.80	13.30
96.037.M-3797	—	29.50	24.95	13.00	6.30	7.65	9.35	6.00	15.05	2.65	5.40	6.95	1.90	3.10	2.80	—
96.037.M-3798	—	27.40	23.20	11.30	5.90	7.35	9.00	6.00	14.00	2.95	4.95	6.95	1.80	2.95	2.75	—
96.037.M-3799	30.00	28.50	23.80	12.35	6.20	7.55	9.15	6.35	15.25	2.70	5.45	6.95	1.90	2.85	3.00	11.50
96.037.M-3800	—	29.00	24.85	12.60	6.20	7.85	9.10	5.80	14.45	2.95	5.00	6.90	1.85	3.25	2.80	—
96.037.M-3801	28.85	27.45	23.15	11.70	6.25	7.65	9.05	5.85	14.40	2.90	4.90	6.85	1.80	2.95	2.85	11.10
96.037.M-3802	31.85	30.60	26.30	13.20	6.65	8.35	9.75	6.20	15.90	3.35	5.15	7.40	1.70	2.90	3.15	12.65
96.037.M-3803	29.45	28.25	23.85	12.20	5.95	7.35	8.90	5.65	14.15	3.10	5.15	6.85	1.75	3.15	2.55	11.95
96.037.M-3804	29.95	28.45	24.30	12.30	6.25	7.55	9.00	5.75	13.90	3.05	5.20	6.90	1.80	2.85	2.85	11.30
96.037.M-3805	29.20	27.55	23.50	11.60	6.55	7.60	9.20	5.75	14.25	3.20	4.70	7.00	1.75	3.10	2.70	12.30
96.037.M-3806	—	27.80	23.75	12.60	6.15	7.55	9.25	5.80	14.20	2.90	5.00	6.80	1.85	3.00	2.55	—
96.037.M-3807	29.95	28.85	24.50	12.20	6.40	7.90	9.65	6.25	15.20	3.15	5.05	7.25	1.90	3.20	2.75	11.60
96.037.M-3808	29.85	28.55	24.25	12.15	6.35	7.75	9.30	6.00	14.70	3.10	5.00	7.00	1.85	2.90	2.75	11.70
96.037.M-3809	30.05	29.10	24.70	12.50	6.25	8.30	9.75	5.85	14.80	3.20	5.00	6.90	1.80	2.95	2.70	12.25
96.037.M-3810	29.85	28.20	23.75	12.50	6.30	7.60	9.30	5.80	15.10	2.80	5.20	6.85	1.80	2.90	3.10	10.80
96.037.M-3812	31.10	29.90	25.45	12.90	6.60	8.05	9.80	6.00	15.40	3.20	5.40	7.40	1.85	3.05	3.05	12.20
96.037.M-3813	31.70	30.65	26.05	12.70	6.20	7.95	9.80	6.30	15.45	3.15	5.20	7.45	1.80	2.75	2.90	12.50
96.037.M-3814	—	26.45	22.15	11.60	6.15	7.15	8.60	5.45	13.95	2.50	4.90	6.45	1.90	2.95	2.65	—
96.037.M-3815	30.70	29.20	24.85	12.50	6.55	7.90	9.35	6.00	15.20	3.15	5.10	7.10	1.80	3.00	2.95	12.20
96.037.M-3816	30.10	28.90	24.65	12.45	6.00	7.70	9.70	6.05	15.05	3.35	5.10	7.20	1.85	3.10	2.70	12.05
96.037.M-3820	29.65	28.50	24.35	12.20	6.75	7.70	9.20	6.75	14.75	3.15	5.10	7.15	1.80	2.90	2.90	11.40
96.037.M-3826	31.25	29.85	25.45	12.85	6.50	8.25	9.75	6.00	15.20	3.25	5.00	7.00	1.70	3.25	2.70	12.20

Table 13. [cont.] Listing of the craniometric data of the type and paratypes of *Lophuromys sabunii* n.sp.

NUMB	M17	M18	M19	M20	M21	M22	M23	M24	W	TOL	HB	TL	HF	EL
Type														
96.037.M-3796	4.30	1.50	5.45	12.65	1.15	6.15	4.65	8.65	44	199	126	73	21.1	18.4
Paratypes														
96.037.M-3789	4.65	1.45	5.60	13.25	1.30	6.25	5.15	8.75	56	193	124	69	21.4	15.6
96.037.M-3790	4.55	1.30	5.45	13.75	1.20	6.20	5.05	8.85	61	205	136	69	21.6	17.6
96.037.M-3791	4.35	1.05	5.80	13.20	1.20	6.20	4.85	8.75	60	201	130	71	22.9	12.2
96.037.M-3793	4.50	1.45	5.70	13.10	1.35	6.40	4.80	8.85	60	210	136	74	22.6	16.2
96.037.M-3794	4.50	1.35	5.40	12.95	1.20	6.30	5.05	8.90	52	—	132	—	22.4	16.4
96.037.M-3795	4.45	1.30	5.70	13.50	1.20	6.55	5.05	9.55	68	—	145	—	22.2	17.0
96.037.M-3797	4.80	1.05	5.55	12.75	1.20	6.50	4.80	8.70	50	206	131	75	21.7	16.7
96.037.M-3798	4.50	1.45	5.40	13.05	1.25	6.05	4.50	8.05	42	194	122	72	21.7	17.7
96.037.M-3799	4.75	1.35	5.25	13.40	1.40	6.50	4.95	8.90	53	200	124	76	—	—
96.037.M-3800	4.40	1.25	5.80	12.60	1.15	6.50	4.90	9.20	50	217	129	88	21.4	17.2
96.037.M-3801	4.50	1.45	5.45	13.00	1.20	6.05	4.75	8.35	40	193	124	69	20.6	17.0
96.037.M-3802	4.75	1.10	5.70	13.10	1.20	6.80	5.40	9.50	60	225	144	81	22.1	18.8
96.037.M-3803	4.65	1.30	5.50	12.60	1.15	5.85	4.55	8.60	40	202	126	76	23.2	18.2
96.037.M-3804	4.55	1.50	5.45	12.70	1.15	6.05	4.85	8.60	53	206	129	77	22.1	18.3
96.037.M-3805	4.30	1.35	5.40	12.55	1.25	5.75	4.70	8.50	40	196	123	73	20.0	17.2
96.037.M-3806	4.50	1.05	5.60	12.50	1.15	6.30	4.70	9.00	56	193	120	73	21.2	18.4
96.037.M-3807	4.70	1.25	5.50	13.00	1.25	6.55	4.80	8.70	48	197	125	72	20.9	17.6
96.037.M-3808	4.65	1.20	5.55	13.00	1.20	6.15	4.80	8.85	45	200	126	74	21.7	18.0
96.037.M-3809	4.40	1.25	5.30	12.45	1.35	6.50	4.85	8.50	56	165	130	35	19.8	16.7
96.037.M-3810	4.65	1.30	5.20	13.20	1.20	6.20	4.85	8.75	46	—	126	—	22.7	16.5
96.037.M-3812	4.85	1.50	5.55	12.85	1.15	6.55	5.15	9.20	61	221	135	86	22.7	16.4
96.037.M-3813	4.55	1.55	5.45	12.80	1.30	6.40	5.15	8.75	55	219	138	81	22.5	17.2
96.037.M-3814	4.50	1.50	5.05	12.50	1.15	5.85	4.25	8.20	47	231	158	73	20.3	16.6
96.037.M-3815	4.60	1.30	5.80	13.35	1.20	6.35	4.85	9.10	52	142	112	30	21.2	18.7
96.037.M-3816	4.60	1.70	5.35	13.10	1.15	6.05	4.90	8.35	50	211	132	79	21.2	18.4
96.037.M-3820	4.50	1.40	5.35	12.90	1.15	6.15	4.85	8.75	50	197	126	71	21.3	17.2
96.037.M-3826	4.50	1.15	5.65	13.25	1.15	6.40	4.75	9.00	68	213	136	77	22.3	17.0

Table 14. Listing of the craniometric data of the type and paratypes of *Lophuromys makundii* n.sp.

OTU 25 Mt Hanang

NUMB	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
Type																
96.037.M-2325	29.30	28.10	23.90	12.15	6.40	7.65	8.85	5.85	14.20	2.85	4.95	6.50	1.70	2.90	2.60	11.85
Paratype																
96.037.M-2312	29.55	28.10	23.95	11.75	6.05	7.75	9.10	5.80	14.15	2.80	4.75	6.50	1.70	2.95	2.65	11.70
96.037.M-2324	29.85	28.70	24.70	12.20	6.15	8.00	9.30	5.55	14.80	3.00	4.40	6.50	1.60	2.85	2.70	11.95
96.037.M-2326	27.60	26.30	22.20	11.65	6.05	7.30	8.65	5.90	13.45	2.95	4.55	6.25	1.60	2.75	2.50	11.30
96.037.M-2327	—	27.55	23.35	11.55	6.35	7.30	8.60	5.75	13.40	2.55	4.80	6.25	1.70	2.65	2.45	—
96.037.M-2328	28.90	27.65	23.30	11.85	6.25	7.30	8.30	5.65	13.90	2.75	4.85	6.25	1.75	3.05	2.60	12.10
96.037.M-2313	29.00	27.95	23.70	11.95	6.20	7.50	8.70	5.95	13.65	2.70	5.00	6.30	1.75	2.75	2.55	11.95
96.037.M-2314	29.00	27.35	23.15	11.95	6.35	7.80	9.25	5.35	13.90	2.85	4.65	6.25	1.70	2.60	2.60	11.60
96.037.M-2315	30.85	29.80	25.55	12.50	6.50	8.20	9.80	5.95	15.20	3.45	4.85	6.85	1.55	3.10	2.75	12.20
96.037.M-2316	—	28.40	24.20	12.15	6.15	7.65	8.95	5.95	14.00	3.05	4.95	6.55	1.75	2.75	2.35	—
96.037.M-2317	29.30	27.80	23.80	11.70	6.55	7.60	8.65	5.90	13.70	3.00	4.85	6.35	1.60	2.85	2.70	12.30
96.037.M-2318	—	28.15	—	12.40	6.30	7.90	9.35	5.70	14.25	3.15	4.85	6.55	1.65	2.80	2.60	12.60
96.037.M-2319	30.85	29.15	24.75	12.25	6.40	8.15	9.25	5.75	14.50	2.75	4.75	6.40	1.70	2.75	2.70	12.40
96.037.M-2320	28.65	27.85	24.00	11.75	6.20	7.35	8.50	5.80	13.75	2.70	4.95	6.30	1.75	2.80	2.70	11.70
96.037.M-2321	—	28.90	24.60	12.25	6.50	8.05	9.50	5.80	14.80	2.95	5.00	6.45	1.70	2.75	2.70	—
96.037.M-2322	29.85	29.00	24.55	11.95	6.15	7.95	9.20	5.85	14.25	3.05	4.65	6.40	1.65	2.90	2.90	12.55
96.037.M-2323	30.05	28.65	24.25	12.35	6.15	7.60	8.65	5.75	13.90	2.75	4.90	6.45	1.75	3.05	2.75	11.95
96.037.M-2329	—	28.25	23.75	11.90	6.25	7.75	9.05	6.15	15.00	3.25	4.85	6.90	1.70	2.95	2.75	—
96.037.M-2330	29.55	28.30	24.00	11.70	6.10	7.65	8.95	5.95	14.15	2.75	4.80	6.25	1.65	3.10	2.60	11.90
96.037.M-2332	29.65	28.35	24.15	12.20	6.20	7.75	9.00	5.85	14.35	3.10	4.90	6.60	1.60	3.00	2.65	11.60

NUMB	M17	M18	M19	M20	M21	M22	M23	M24	W	TOL	HB	TL	HF	EL
Type														
96.037.M-2325	4.20	1.25	5.00	12.25	1.25	6.10	4.95	8.45	50	203	120	83	21.3	20.4
Paratype														
96.037.M-2312	4.15	1.20	5.15	12.35	1.25	6.30	5.40	8.60	47	—	125	—	22.3	20.5
96.037.M-2324	4.00	1.00	5.10	12.00	1.20	6.45	5.15	9.10	56	203	131	72	21.9	17.1
96.037.M-2326	4.10	1.15	5.20	12.40	1.20	5.85	4.70	8.45	46	198	122	76	21.0	17.5
96.037.M-2327	3.90	1.00	5.10	11.95	1.20	5.95	4.75	8.35	42	205	126	79	21.0	16.5
96.037.M-2328	4.20	1.15	5.20	11.75	1.30	5.95	4.75	8.70	33	197	121	76	21.7	18.9
96.037.M-2313	4.20	1.25	5.30	11.95	1.25	5.95	4.85	8.20	48	—	123	—	23.1	18.9
96.037.M-2314	4.25	1.25	5.20	11.85	1.20	6.05	4.80	7.95	50	195	121	74	21.7	18.4
96.037.M-2315	4.20	1.20	5.65	12.65	1.25	6.50	5.15	9.15	54	204	123	81	22.5	19.1
96.037.M-2316	4.15	1.15	5.20	12.05	1.25	6.05	4.85	8.25	54	212	127	85	22.0	18.4
96.037.M-2317	4.20	1.35	5.10	12.20	1.30	6.00	4.65	8.25	42	187	118	69	21.2	17.9
96.037.M-2318	4.05	1.15	5.35	12.25	1.35	6.40	5.25	8.85	52	199	127	72	22.4	20.6
96.037.M-2319	4.10	1.15	5.30	12.60	1.30	6.45	5.10	8.65	52	193	134	59	22.4	19.5
96.037.M-2320	4.35	1.15	5.15	12.00	1.20	5.95	5.15	8.55	58	203	129	74	21.0	18.9
96.037.M-2321	4.25	1.20	5.25	12.70	1.20	6.50	5.35	8.85	49	202	124	78	22.0	18.5
96.037.M-2322	4.20	1.10	5.20	12.25	1.30	6.25	5.00	8.35	40	211	129	82	21.9	20.1
96.037.M-2323	4.30	1.30	5.10	12.35	1.20	5.85	4.90	8.85	54	208	130	78	22.7	17.7
96.037.M-2329	4.35	1.10	5.10	12.35	1.20	6.50	5.00	8.45	50	180	124	56	22.0	18.0
96.037.M-2330	4.10	1.10	5.25	12.55	1.25	6.25	4.85	8.75	50	199	123	76	22.4	18.2
96.037.M-2332	4.20	0.90	5.25	12.55	1.30	6.35	4.95	8.30	50	204	121	83	21.7	20.7

Appendix 1.

Listing of the studied Operational Taxonomical Units (OTU's) with specimen information for OTU's that are new, or extended, compared to Verheyen *et al.*, 2002.

OTU 1 - **Congo NW**.
M(9), F(9); cl1(3), cl2(10), cl3(4), cl4(1)

OTU 2 - **Congo NE.**
M(3), F(8), sex?(6); cl1(3), cl2(12), cl3(2)

OTU 3 - **Kisangani Left Bank**
M(18), F(17), sex?(1); cl1(6), cl2(18), cl3(12)

OTU 4 - **Kisangani Right Bank**
M(72), F(66), sex?(6); cl1(24), cl2(67), cl3(42), cl4(11)

OTU 5 - **Irangi**
M(20), F(26), sex?(1); cl1(5), cl2(22), cl3(15), cl4(5)

OTU 6 - **Tshibati**
M(210), F(173), sex?(18); cl1(106), cl2(152), cl3(131), cl4(12)

OTU 6.1 - **Kahuzi Mt**
M(4), F(6), sex?(1); cl1(3), cl2(1), cl3(6), cl4(1)

OTU 7 - **Virunga Volcanoes**
M(84), F(69), sex?(44); cl1(27), cl2(93), cl3(61), cl4(14)

OTU 8 - **Mutura**
M(67), F(62), sex?(2); cl1(15), cl2(67), cl3(36), cl4(13)

OTU 8.1 - **Kinigi**
M(59), F(49), sex?(2); cl1(41), cl2(48), cl3(15), cl4(6)

OTU 8.2 - **Kidaho**
M(20), F(17); cl1(1), cl2(17), cl3(15), cl4(4)

OTU 9 - **Butare**
M(24), F(33), sex?(1); cl1(6), cl2(36), cl3(22), cl4(9)

OTU 9.1 - **Rwanda E.**
M(16), F(9), sex?(2); cl1(3), cl2(14), cl3(10)

OTU 10 - **Uwinka (Nyungwe Forest)**
M(37), F(17), sex?(6); cl1(4), cl2(28), cl3(24), cl4(4)

OTU 11 - **Congo S.**
M(18), F(12), sex?(5); cl1(10), cl2(21), cl3(6), cl4(1)

OTU 12 - **Gilo (Imatong Mts)**
M(55), F(55); cl1(23), cl2(54), cl3(27), cl4(6)

OTU 13 - **Iwatoka**
M(7), F(6), sex?(4); cl1(3), cl2(4), cl3(7), cl4(2),cl?(1)

OTU 14 - **Mt Ruwenzori**
M(27), F(18); cl1(13), cl2(19), cl3(13)
BUJUKU, FMNH, 144.713, 144.714, 144.715, 144.716, 144.718, 144.719, 144.720, 144.730, 144.741, 144.750, 144.753, 144.754, 144.755, 144.761, 144.774, 144.778, 144.779, 144.783, 144.786, 144.789, 144.794, 144.799, 144.805, 144.812, 144.820
MUBUKU, FMNH, 144.649, 144.654, 144.657, 144.658, 144.662, 144.666, 144.673, 144.674, 144.678, 144.686, 144.688, 144.692, 144.705, 144.707, 144.722, 144.731, 144.735, 144.738, 144.742, 144.748

OTU 14.1 - **Mt Ruwenzori (BMNH)**
M(9), F(9), sex?(2); cl1(3), cl2(11), cl3(5), cl4(1)

BIGO,	BMNH,	76.456, 77.229, 77.231
KALASABANGO,	RMCA,	820.11.M.405
KALINDERARMCA,	820.11.M.360, 820.11.M.406, 820.11.M.407	
KIONDO,	KBIN,	13442, 13444
MARION,	RMCA,	820.11.M.418, 820.11.M.419
NYAMALEJU,	BMNH,	77.234, 77.235
RUWENZORI,	AMNH,	82711, 82713, 82714, 82718
	BMNH,	6.7.1.17, 6.7.1.18
WUSUWAMESO,	RMCA,	820.11.M.469

OTU 15 - **Rutshuru**
M(25), F(16), sex?(5); cl1(5), cl2(19), cl3(20), cl4(2)

OTU 16 - **Kigesi**
M(21), F(24), sex?(1); cl1(7), cl2(18), cl3(19), cl4(2)

OTU 17 - **Uganda**
M(9), F(6); cl1(1), cl2(6), cl3(6), cl4(2)

OTU 17.1 - **Bugala Isl.**
M(5), F(8); cl1(2), cl2(6), cl3(4), cl4(1)

OTU 18 - **Elgon Mt**
M(9), F(4), sex?(1); cl1(1), cl2(9), cl3(4)

OTU 19 - **Cherangani Hills**
M(18), F(13); cl1(6), cl2(15), cl3(7), cl4(3)

OTU 19.1 **Kaptagat**
M(3), F(1), sex?(2); cl1(2), cl2(1), cl3(3)

OTU 20 - **Solai**
M(21), F(25), sex?(1); cl1(1), cl2(18), cl3(26), cl4(2)

OTU 21 - **Aberdare Range**
M(14), F(13), sex?(4); cl1(11), cl2(8), cl3(10), cl4(2)

OTU 21.1 - **Gatamaiyu**
M(8), F(3); cl1(2), cl2(5), cl3(4)

OTU 21.2 - **Aberdare Range (BMNH)**
M(10), F(10); cl2(7), cl3(12), cl4(1)

OTU 22 - **Kenya Mt**
M(21), F(12), sex?(3); cl1(5), cl2(13), cl3(18)

OTU 22.1 - **Kenya Mt (BMNH)**
M(22), F(11); cl1(2), cl2(18), cl3(13)

OTU 23 - **Meru Mt**
M(35), F(15), sex?(1); cl1(8), cl2(18), cl3(19), cl4(6)

OTU 24 - **Ngorongoro Rim**
M(17), F(12); cl1(4), cl2(22), cl3(3)

OTU 25 - **Hanang Mt**
M(9), F(8), sex?(3); cl2(11), cl3(8), cl4(1)

OTU 26 - **Usambara E.**
M(33), F(28); cl1(5), cl2(30), cl3(25), cl4(1)

OTU 27 - **Uluguru Range**
M(71), F(94); cl1(13), cl2(59), cl3(77), cl4(15),cl?(1)

OTU 28 - **Mufindi**
M(8), F(7); cl1(2), cl2(7), cl3(6)

OTU 29 - **Peramiho**
M(9), F(8); cl1(3), cl2(9), cl3(3), cl4(2)

OTU 30 - **Rungwe Mt**
M(34), F(37); cl1(4), cl2(40), cl3(23), cl4(4)

OTU 31 - **Ufipa Plateau**
M(24), F(15), sex?(2); cl1(8), cl2(25), cl3(5), cl4(3)

OTU 32 - **Nyika Plateau**
M(15), F(14), sex?(1); cl1(1), cl2(22), cl3(4), cl4(3)

OTU 33 - **Zomba**
M(7), F(4), sex?(1); cl1(4), cl2(5), cl3(2), cl4(1)

OTU 34 - ***L.flavopunctatus* s.s.**
M(8), F(8); cl1(1), cl2(7), cl3(8)

OTU 35 - ***L.melanonyx***
M(9), F(12); cl1(3), cl2(8), cl3(9), cl4(1)

OTU 36 - ***L.brunneus***
M(13), F(16); cl1(5), cl2(8), cl3(14), cl4(2)

OTU 37 - ***L.brevicaudus***
M(50), F(59), sex?(11); cl1(23), cl2(37), cl3(52), cl4(7), cl?(1)

OTU 38 - ***L.chrysopus* E.**
M(25), F(23), sex?(1); cl1(2), cl2(28), cl3(16), cl4(3)

OTU 39 - ***L.chrysopus* W.**
M(13), F(13), sex?(2); cl1(2), cl2(9), cl3(14), cl4(3)

OTU 40 - ***L.ansorgei***
M(37), F(46), sex?(1); cl1(34), cl2(33), cl3(13), cl4(4)

OTU 50.1 - **Mt Kilimanjaro E.**
M(26), F(26), sex?(1); cl1(4), cl2(20), cl3(27), cl4(2)

MANDARA FOREST, RUCA, CTZ1734, CTZ1735, CTZ1740, CTZ1742, CTZ1753, CTZ1754, CTZ1765, CTZ1767, CTZ1768, CTZ1773, CTZ1774, CTZ1790, CTZ1792, CTZ1795, CTZ1796, CTZ1800, CTZ1831
MARANGU GATE, RUCA, CTZ1653, CTZ1664, CTZ1679, CTZ1680, CTZ1681, CTZ1682, CTZ1683, CTZ1691, CTZ1692, CTZ1706, CTZ1728, CTZ1729, CTZ1730, CTZ1731
MAUNDI CRATER, RUCA, CTZ1750, CTZ1751, CTZ1752, CTZ1776, CTZ1777, CTZ1778, CTZ1780, CTZ1806, CTZ1810, CTZ1821, CTZ1822, CTZ1846, CTZ1847, CTZ1848, CTZ1849, CTZ1850, CTZ1950
MWEKA, RUCA, 14355, 14364, 14378, 14398, 14399

OTU 50.2 - **Mt Kilimanjaro W.**
M(15), F(14); cl1(6), cl2(11), cl3(12)

LONDOROSI, RUCA, CTZ1547, CTZ1548, CTZ1549, CTZ1550, CTZ1551, CTZ1552, CTZ1553, CTZ1561, CTZ1564, CTZ1567, CTZ1608, CTZ1609, CTZ1611, CTZ1612, CTZ1654, CTZ1655, CTZ1662, CTZ1663, CTZ1664, CTZ1998, CTZ1999, CTZ2000
SHIRA, RUCA, CTZ1576, CTZ1586
SIMBA, RUCA, CTZ1629, CTZ1652, CTZ1653, CTZ1660, CTZ1661, CTZ1661

OTU 600 - ***L.sikapusi***
M(126), F(98); cl1(0), cl2(158), cl3(50), cl4(15), cl?(1)

MOPOYEM, RMCA, 688, 709, 824, 861, 949, 2017-18, 2112, 2118, 2126, 2139-40, 2158, 2264, 2266, 2283, 2558, 2561-62, 2579, 2582-83, 2623, 2663, 2757, 2786, 2864, 2889, 2940, 2954, 4022-23, 4025, 4036, 4063, 4067-68, 4098, 4124-27, 4129-31, 4133, 4135-37, 4171, 4258, 4283, 4290, 4305, 4307, 4311, 4331-33, 4357-58, 4360, 4382, 4385, 4407, 4410-11, 4430, 4460, 4462, 4464-65, 4513, 4515, 4580, 4605, 4606-07, 4617-18, 4620-21, 4623, 4658, 4684-85, 4688, 4699, 4735, 4738, 4744, 4760-61, 4786, 4788-90, 4792, 4795, 4798, 4806, 4831, 4833, 4835-37, 4855, 4857, 48-83, 4887-88, 4902, 4904, 4917, 4958, 4992, 5128-29, 5147, 5207, 5214-15, 5455-57, 5459, 5461-66, 54-97, 5523-24, 5712, 5714, 5718, 5726, 5728-29, 5731, 5744-48, 5755, 5799-800, 5836, 7016-19, 7198, 7436, 7471, 7513, 7536, 7553, 7568, 7573, 7592-94, 7601-02, 7612, 7625, 7691, 7719, 7748, 7775, 7815-16, 7818, 7870, 7937, 7938, 7972, 7991, 65.3257, A21212, A4028, A4031, A4059, A4090, A4094, A4151, A4200, A4209, A4237, A4264, A4296, A4318, A4372, A4724, A4732, A4745, A4875, A4907, A4909, A4947, A4951, A4980, A4983, A5008, A5011, A5028, A5031, A5093, A5097, A5132, A5138, A5175, A5195, A5217, A5218

OTU 700 - **Menagesha**
cf. LAVRENCHENKO, 2007 (this volume, p. 115)